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ABSTRACT

This report describes the efforts of the National Science Foundation (NSF) and its Division of Undergraduate Education (DUE) to provide educational support to two-year colleges to strengthen science, technology, engineering, and mathematics programs through grants, collaborative efforts, and support for curriculum materials and teacher activities. Following introductory materials indicating that 124 awards totaling $7,576,998 were made in 1993 to programs in which two-year colleges were among the principal investigators, the report describes efforts of DUE, the focal point for NSF's activities with two-year colleges. This section indicates that DUE provides support to two-year colleges primarily through leadership activities and leveraged program support. Leadership activities described include the Advanced Technological Education Program to promote exemplary improvement in technical instruction and "Partners in Progress" workshops. Leveraged program support activities reviewed include instrumentation and laboratory improvement, undergraduate faculty enhancement, and course and curriculum development. Next, abstracts are provided of projects receiving DUE grant awards in the fields of atmospheric sciences, chemistry, computer science, engineering (including interdisciplinary, electrical, and metallurgy and materials), geography, geological sciences, life/biological sciences, mathematics, interdisciplinary, physics, and psychology. Each abstract includes the name of the institution, the amount awarded, the NSF division making the award, and a brief program description. (MAB)

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ACTIVITIES IN SUPPORT OF TWO-YEAR COLLEGE SCIENCE, ENGINEERING, TECHNOLOGY, AND MATHEMATICS EDUCATION

FISCAL YEAR 1993
Highlights

JC 940 377

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Division of Undergraduate Education
National Science Foundation

ACTIVITIES IN SUPPORT OF TWO-YEAR COLLEGE SCIENCE, ENGINEERING, TECHNOLOGY, AND MATHEMATICS EDUCATION

To meet the economic and social needs of today's society, America's colleges and universities are being called upon to produce mathematically and scientifically literate workers and citizens. The nation's two-year colleges are ideally positioned to serve as catalysts in this effort because while they serve a variety of purposes, they all have a single dominant mission -- effective education for all students. The National Science Foundation (NSF) recognizes the critical role that two-year colleges play in science, technology, engineering, and mathematics education. These colleges bring three crucial strengths to the development of our nation's resources. First, they support a great diversity of learning objectives ranging from technical education and career-oriented courses to remediation and transfer to four-year colleges and universities. Second, they provide access to higher education for many who might not otherwise have the opportunity and enroll large numbers of minority and female students. Third, they take their service to the community seriously by offering courses designed to help upgrade the work force and renew job skills as well as activities and courses for life-long learning.

The National Science Foundation provides educational support to two-year colleges through leadership activities and leveraged program support. The primary support to two-year colleges at the Foundation has been through programs in the Directorate for Education and Human Resources (EHR) although as seen in Table 1 some support is through the research directorates. NSF intends to play a major role in strengthening science, technology, engineering, and mathematics programs in two-year colleges in at least three ways: (a) through grants made directly to two-year colleges, (b) through collaborative efforts in which two-year colleges play a major role, and (c) through support of curriculum materials and teacher activities that benefit students and faculty in two-year colleges as well as others in the academic community.

The Division of Undergraduate Education is the focal point of NSF activities in support of science, engineering, technology, and mathematics education in two-year colleges. To set the Division's activities in the broader context of NSF activities, this document also includes information on NSF-wide support.

Table 1

FOUNDATION-WIDE AWARDS TO TWO-YEAR COLLEGES

	1992		1993	
Directorate	# Awards	Dollars	# Awards	Dollars
Office of Director	0	0	4	57,783
Mathematical and Physical Sciences	2	100,000	1	66,000
Social, Behavioral, and Economic Sciences	1	8,625	2	131,834
Computer and Information Science and Engineering	5	372,317	11	294,777
Geosciences	3	129,931	0	0
Engineering	1	39,142	2	272,285
Biological Sciences	3	204,450	2	647,000
Education and Human Resources	92	6,466,624	102	6,107,319
TOTAL	107	$7,321,189*	124	$7,576,998*

* These figures only include those awards where one of the principal investigators is at a two-year college. Data is not included on awards in which two-year colleges are part of consortia but principal investigators are not from two-year colleges. There is significant support to two-year colleges through such consortia activities.

Table 2

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES AWARDS TO TWO-YEAR COLLEGES

	1992		1993	
	# Awards	Dollars	# Awards	Dollars
Division of Undergraduate Education	73	3,355,338	93	5,603,451
Elementary, Secondary and Informal Education	17	2,702,830	6	329,830
Human Resource Development	2	208,456	2	174,038
TOTAL	92	$6,466,624*	102	$6,107,319*

* These figures only include those awards for which the principal investigator is at a two-year college. Data is not included on awards in which two-year colleges are part of consortia but principal investigators are not from two-year colleges. There is significant support to two-year colleges through such consortia activities.

During the 1993 fiscal year, six faculty members from two-year colleges served as program directors in various divisions. EHR also continued the NSF/AACC Fellows program begun in 1992 in conjunction with the American Association of Community Colleges (AACC). Fellows work with NSF to achieve national outreach to the two-year college community. Two community college leaders serve on the EHR Advisory Committee.

Workshops

In 1993 EHR sponsored a series of three regional workshops which were attended by approximately 500 administrators and faculty members, primarily from two-year colleges but also from four-year institutions and secondary schools. The goals of the workshops were to encourage quality proposals to NSF programs, to provide information on NSF programs of interest to two-year colleges and their academic and industrial partners, and to give the community an opportunity to respond to NSF's plan for technological education. The workshops were held at Montgomery College, Maryland; the annual convention of the American Association of Community Colleges in Portland, Oregon; and the annual convention of National Coalition of Advanced Technology Centers in Chicago, Illinois. In addition, NSF Program Directors and NSF/AACC Fellows gave numerous presentations at professional meetings.

DIVISION OF UNDERGRADUATE EDUCATION

The Division of Undergraduate Education (DUE) serves as the focal point for NSF's activities with two-year colleges. The Division Director of DUE serves as NSF's official liaison between two-year colleges and the Foundation. The Division has provided support for two-year colleges through both leadership activities and leveraged program support.

Leadership Activities

Advanced Technological Education

Both Congress and the White House have emphasized the importance of the technical work force in a global competitive economy. The *Scientific and Advanced Technology Act of 1992* called for the National Science Foundation to establish a national program to improve the education for technicians in advanced technology fields utilizing the resources of the nation's two-year colleges. In August 1993, NSF announced the ***Advanced Technological Education*** (ATE) program (NSF 93-132). These efforts have created a sound foundation for cultivating innovative programs to advance technological education in the United States. The purpose of the new ATE program is to promote exemplary improvement in advanced technological education at the national and regional level through support of curriculum development and program improvement for technicians being educated for the high performance workplace of advanced technologies. The focus of the ATE program is the development of strategies to strengthen two-year college technician education as well as improving the education of prospective technicians at the secondary school level. Expanding opportunities for technicians at four-year colleges and universities and after employment are also addressed. Those projects and centers supported through the ATE program will result in major improvements in advanced technological education, build collaborations among academic institutions and between academe and industry, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-usable educational products. The ATE program is managed in the Division of Undergraduate Education (DUE) in cooperation with the Division of Elementary, Secondary, and Informal Education (ESIE). A description of activities to date in the program are described later in this document. For FY94, there is approximately $14.6 million ($9.8 in DUE and $4.8 in ESIE) available for support of Centers, planning grants for Centers, and projects.

Partners in Progress

To provide a base for future activities and projects designed to improve science, technology, engineering, and mathematics education in two-year colleges utilizing the resources and networking available from professional societies, NSF convened a workshop, ***Partners in Progress***, on October 29-30, 1992. The report from this workshop, ***Partners in Progress*** (NSF 93-64), was published in July 1993 and distributed to the scientific and technical communities in two-year colleges as well as to the 24 participating professional societies. The format of the workshop was designed to give participants opportunities to think about broad issues as well as strategies for their own disciplines. Each interdisciplinary working group addressed one of five key issues which gave substance and structure to the proceedings:

- the integrated teacher/scholar role in two-year colleges;
- formation of networks among two-year college leaders;
- professional society actions to promote membership and leadership;
- professional society actions to enhance lower division science, technology, engineering, and mathematics education; and
- funding for two-year college initiatives.

Participants also met with others in their disciplines to discuss actions that professional societies should take to implement recommendations of the interdisciplinary working groups. The participants representing discipline-related professional societies made specific recommendations relevant to these disciplines and prepared the groundwork for presentation of these recommendations to their respective societies. During the past year these recommendations have served as a basis for many professional society actions in support of science, technology, engineering, and mathematics education in two-year colleges.

Gaining the Competitive Edge: Critical Issues in Science and Engineering Technician Education

This NSF/FCCSET workshop, ***Gaining the Competitive Edge: Critical Issues in Science and Engineering Technician Education (NSF 94-32)***, was a natural extension of recent workshops, studies, and reports supported by the National Science Foundation (NSF) to help improve science, technology, engineering and mathematics education in the United States. The workshop held July 21 - 23, 1993 in Washington, D. C. was in response to a nationally recognized need for a well-educated technical work force in the high performance work place of advanced technologies. The workshop was timely because it has become increasingly apparent that for the United States to maintain a competitive edge in the world market, the technical component of the work force must be better prepared than the corresponding work force in other industrialized countries. The purpose of the workshop was to identify critical issues in science and engineering

technician education; to develop recommendations for industry, academe, and government; and to engage these communities into action. Deliberations focused on development of strategies to strengthen two-year college technician education programs; however, improving education programs for prospective technicians at the secondary school level and expanding opportunities for technicians at four-year colleges and universities and after employment were addressed as well. The workshop report (NSF 94-32) was published in May of 1994.

Coalition Building for Effective Faculty Enhancement

In October of 1993 the Division of Undergraduate Education sponsored a workshop on ***Coalition Building for Effective Faculty Enhancement***. Participants included principal investigators from two- and four-year coalitions supported under the Undergraduate Faculty Enhancement, Course and Curriculum, and Calculus projects plus selected other individuals who had expertise relative to coalitions. The goals of the workshop were to

- develop a guidebook that could be used by individuals who are planning and leading coalitions,
- identify needs of community college faculty relative to faculty enhancement,
- generate increased interest from the scientific community in forming cooperative and collaborative projects,
- increase interest in interdisciplinary projects, and
- discuss evaluation and dissemination for coalition projects.

It is expected that the guidebook will be published in the fall of 1994.

Survey on Technical Education in Two-Year Institutions

In 1993, the Division of Science Resource Studies in cooperation with the Division of Undergraduate Education and the Division of Research, Evaluation, and Dissemination conducted a ***Survey on Technical Education in Two-Year Institutions***. This was the first study conducted by NSF on technical education. The questionnaire requested descriptive information including data on degrees and transfer arrangements and agreements. The data has been partially analyzed, and it is expected that the final report will be published in the fall of 1994. Preliminary data analysis prepared includes information on number of associate degree and certificate programs in various engineering and science technology fields (e.g., electronics, computer technology, manufacturing technology, chemical technology, biotechnology, etc.), number of students enrolled in such programs, and characteristics of faculty teaching in these programs.

Federal Coordinating Council on Science, Engineering, and Technology (FCCSET) Activities

Four program directors and one division director in EHR served on the FCCSET-CEHR Joint Working Group on Technical Education. This group met regularly in 1993. A report was issued by this committee on current and future activities in the federal government in support of technical education. This committee was one of the sponsors of the ***Gaining the Competitive Edge*** workshop. In winter of 1993-94 the National Scientific and Technology Council (NSTC) replaced FCCSET.

Diversity in the Scientific and Technological Work Force: Transition from Two-Year Colleges to Four-Year Colleges and Universities

The second annual national conference on Diversity in the Scientific and Technological Work Force, sponsored by EHR, focused on the participation of minorities in science, technology, engineering, and mathematics (STEM) education. The Division of Undergraduate Education organized a session entitled *Transition of Students From Two-Year to Four-Year Colleges*. This session dealt with the successful transition of minority students to four-year institutions. The objectives of the session were to develop strategies for achieving the broader goal of a significant increase by the year 2000 of minority students enrolled in science and engineering in two-year colleges that successfully transfer to four-year institutions. The speakers with audience participation addressed pertinent issues including

- identifying, retaining, and guiding students for potential life long STEM careers;
- articulation between two- and four-year institutions to increase student success rates in four-year institutions; and
- presentation of data on two-year college students and institutional characteristics with a view towards successful transition of minorities to four-year programs.

The workshop report entitled ***2nd Annual Conference on Diversity in the Scientific and Technological Workforce*** (NSF 94-12) was published in the spring of 1994.

Leveraged Program Support

Faculty members who vigorously combine teaching with scholarship are essential to the creation of vital science, technology, engineering, and mathematics education. The Foundation seeks to provide incentives and rewards to stimulate and motivate faculty members so that creative teaching and instructional scholarship become a part of the "faculty culture" at all institutions. Faculty members who are primarily teachers need opportunities to deepen their knowledge as well as opportunities to work in the creative renewal of undergraduate courses, curricula, and laboratories.

DUE direct support to two-year colleges in FY1993 was through the following programs:

- Instrumentation and Laboratory Improvement (ILI) program for the development of new or improved laboratory courses or experiments;
- Course and Curriculum Development (CCD) for projects to improve the quality of courses and curricula;
- Calculus and the Bridge to Calculus to foster improvement in the quality of calculus instruction and preparation for calculus on a national scale; and
- Undergraduate Faculty Enhancement (UFE) to enable faculty members to learn about new techniques and developments in their fields.

The new program in Advanced Technological Education (ATE) initiated in 1993 focuses on the education of science and engineering technicians, primarily in two-year colleges, in strategic advanced technology fields. The first awards in this program will be made in FY1994, although DUE has provided some support for technician education for the past several years through ILI, CCD, and UFE. Until 1993 this was primarily through the ILI program; however, in 1993 awards were made in UFE and CCD as well as ILI.

The Collaboratives for Excellence in Teacher Preparation program made three awards in 1993. Two-year colleges played a major role in the Collaborative award to Montana State University. Six two-year tribal colleges are among the twelve participating institutions of higher education in the state. Because one of the primary focuses in this collaboratives is increasing the number of Native Americans in the nation's work force who are well-educated in science and mathematics, two-year colleges in Montana are vital to this effort.

Table 3

DIVISION OF UNDERGRADUATE EDUCATION FY93 GRANTS TO TWO-YEAR COLLEGES BY PROGRAM

Program	Number of Awards	Dollars
ILI	63	$2,167,323
CCD	11	1,394,818
Calculus	6*	701,959*
UFE	13*	1,339,351*
Totals	93*	$5,603,451*

* Includes 5 grants (1 in Calculus and 4 in UFE) for $447,307 where the two-year college co-principal investigator was either on a sub-contract or added after the initial award.

Table 4

DIVISION OF UNDERGRADUATE EDUCATION GRANTS TO TWO-YEAR COLLEGES BY PROGRAM FY90-FY93

Program	1990	1991	1992	1993
ILI	48	54	53	63
CCD	-	6	9	11
Calculus	1	2	3	6
UFE	1	2	8	13
Totals	50	64	73	93

Table 5

DIVISION OF UNDERGRADUATE EDUCATION

1993 GRANTS TO TWO-YEAR COLLEGES BY PROGRAM AND DISCIPLINE

	ILI		UFE		CCD	
Chemistry	10	181,616				
Computer Science	3	151,433				
Engineering	7	452,594			3	430,279
Geosciences	1	24,002	1	123,985		
Interdisciplinary	9	398,196	2	280,245	3	342,976
Life Sciences/ Biological	8	160,476				
Mathematics	14	439,195	6	547,964	9	995,391
Physics	9	304,501	3	273,091	1	30,649
Social Sciences	2	55,210				
Totals	63	$2,167,323	13	1,339,351	17	2,096,777

Total for all DUE Programs 93 $5,603,451

Table 6

DIVISION OF UNDERGRADUATE EDUCATION GRANTS TO TWO-YEAR COLLEGES BY PROGRAM COMPARISON OF 1992 AND 1993 AWARDS

Program	1992 Award #s	1992 Award $s	1993 Award #s	% Change	1993 Award $s	% Change
ILI	53	$1,825,280	63	+18.9%	$2,167,323	+18.7%
CCD (Including Calculus)	12	1,123,798	17	+41.7%	2,096,777	+86.6%
UFE	8	606,260	13	+62.5%	1,339,351	+120.9%
Totals	73	$3,555,338	93	+27.4%	$5,606,451	+57.4%

INSTRUMENTATION AND LABORATORY IMPROVEMENT

The Instrumentation and Laboratory Improvement (ILI) program supports the development of new or improved laboratory courses or experiments in science, technology, engineering, or mathematics. The dominant part of the program is Instrumentation Projects (ILI-IP) which provides matching grants for equipment to carry out a proposed project which can then serve as models for the use of instrumentation at other institutions. Grants in the ILI program have been made to over 200 departments in two-year colleges over the past four years. For example, DeKalb College in Atlanta, Georgia is enhancing calculus instruction through the use of technology in laboratories. Calculus students in these laboratories are working in small groups, exploring mathematical concepts using the computer algebra system Mathematica, and constructing written arguments to support their laboratory findings. Sinclair Community College in Ohio has a project directed towards the design and development of experiments to measure various types of heating, ventilating, and air conditioning control units which are used in commercial buildings and other large scale installations. Gulf Coast Community

College in Florida is using computer simulations to provide chemistry students with experience in spectrometry.

The Leadership in Laboratory Development projects (ILI-LLD) portion of the program supports the intellectual effort needed to develop national models for undergraduate laboratory instruction. The ILI-LLD supports project costs beyond equipment. Joliet Junior College in Illinois and Lee College in Texas are providing community college faculty members with workshops on the use of microcomputer-based laboratories (MBLs), conceptual exercises (CE), and overview case studies (OCS) which apply the findings of cognitive physics research to physics laboratories. The impact of the workshops is being reinforced by the establishment of a networking system employing a telecommunications bulletin board and a newsletter.

Table 7

ILI Proposal Activity By Type Institution FY 92 and FY93

	1992			1993		
	# Proposals	# Awards	Success Rate	# Proposals	# Awards	Success Rate
Doctoral Institution	990	164	17%	970	170	17%
Four-Year Institution	1067	372	35%	1022	337	33%
Two-Year Institution	200	53	27%	204	63	31%
Totals	2257	589	26%	2197	569	26%

UNDERGRADUATE FACULTY ENHANCEMENT

The Undergraduate Faculty Enhancement (UFE) program supports projects that enable faculty members who teach undergraduate education to gain experience with recent advances and new experimental techniques in their fields and learn new ways to incorporate these into undergraduate instruction. Projects are regional or national in scope and typically consist of hands-on workshops or short courses, along with follow-up activities. For example, Cypress College in California is providing faculty workshops which emphasize the use of modern tools for teaching introductory geoscience courses. The tools include computer construction of illustrations, maps, and graphs; use of the United States Geological Survey materials such as GLORIA, JEDI, and national snow and ice data; earthquake modeling; and other exciting concepts. Sinclair Community College and William Harper Rainey College are providing workshops for two-year college chemistry faculty where these faculty can explore modern instrumentation techniques and their applications in introductory chemistry courses.

A major component of UFE is regional coalitions of two- and four-year colleges. FY1993 represented the second year of the initiative to encourage regional coalitions of two- and four-year institutions. The coalitions include activities to help faculty learn about new advances in their disciplines and to incorporate these developments into the curriculum. Continuing activities are very important to ensure interaction among coalition members; for that reason coalitions are usually funded for a period of two to three years. The first round of coalitions began during the summer of 1992. In FY93, eight new coalitions were started involving more than $800,000 in NSF support. A total of 17 projects were identified as either coalitions of two-year institutions, coalitions of two- and four-year institutions, or projects at four-year institutions primarily for two-year faculty. For example, the University of Maryland College Park, Montgomery Community College, and Prince Georges' Community College formed a coalition of two- and four-year institutions in the Maryland and District of Columbia area to explore visual thinking in mathematics. Mathematics topics are chosen from chaotic dynamics and fractal geometry. Academic year programs are being conducted in which participants continue the mathematical and curricular dialogue begun during the workshops. Texas A & M University and Lee College formed a coalition for the two-year colleges in Texas. These workshops focus on recent developments in physics research, innovative physics teaching methods, and successful techniques for recruiting local minority students into two-year college science and engineering programs.

Community college faculty also attend many of the other workshops supported by the UFE program.

Table 8

1993 Coalitions by Discipline of Two- and Four Year Institutions or Two-Year Institutions

Discipline	# Projects	# Participants	Funding
Chemistry	1	32	87,077
Computer Science	0	0	0
Engineering	1	55	30,526
Geoscience	2	64	238,051
Interdisciplinary	1	27	199,999
Life Sciences	2	43	133,696
Mathematics	7	154	625,261
Physics/Astronomy	3	209	243,091
Social Sciences	0	0	0
TOTAL	17	584	$1,557,731*

* In some cases funding is for multiple years, however, number of participants is only the 1993 attendees from both two- and four-year institutions.

Table 9

INSTITUTIONAL AFFILIATION OF PARTICIPANTS IN UFE-SUPPORTED WORKSHOPS

	1991		1992		1993	
	49/54 workshops		88/89 Workshops		74/112 Workshops	
Response Rate	91%		99%		66%	
	Number	% Total	Number	% Total	Number	% Total
Two-Year Col.	223	19%	594	29%	427	24%
Four-Year Col.	447	38%	610	30%	547	30%
Universities	496	43%	834	41%	839	46%
TOTAL	1166		2038		1813	

COURSE AND CURRICULUM DEVELOPMENT, CALCULUS, AND LEADERSHIP OPPORTUNITIES IN SCIENCE AND HUMANITIES EDUCATION

Course and Curriculum Development

The Course and Curriculum Development program supports projects to improve the quality of courses and curricula in science, mathematics, engineering, and technology. It encompasses activities affecting the learning environment, content, and experience of instruction. This component seeks projects that envision major changes with potential national impact that result in widely disseminated products such as textbooks, software, and teaching materials. For example, CUNY Queensborough in New York is modernizing its electrical and computer engineering technology courses. The project employs a comprehensive mastery of material, heightens student academic participation and achievement, emulates an industrial work place environment, and enhances academic and employment opportunities for students. Mission College in California is designing a course to increase the technical literacy and awareness of the general student population. SUNY New Delhi is developing a set of case studies in precalculus.

Calculus and the Bridge to Calculus

The purpose of the Calculus Program is to foster improvement in the quality of calculus instruction on the national level. Supported projects include large-scale calculus revision programs, implementation at large institutions or by consortia of institutions, new calculus development projects, and preparation for calculus projects. For example, Evergreen College and Seattle Central Community College, with full cooperation of the Washington Center, are preparing faculty in the state of Washington to adapt and implement the Harvard Calculus Consortium and the Duke calculus projects and evaluating the impact of the programs on student learning. The Maricopa Community College System, with over 100,000 students on 11 campuses, is developing a new bridge to calculus program. SUNY Dutchess is creating a set of laboratories where calculus and physics students have combined laboratory sessions each week. The laboratory part of the course is taking place in their newly renovated Exploratium which was supported through ILI funds.

Many community colleges are being affected by other calculus reform efforts. SUNY Suffolk Community College is part of the Harvard Calculus Consortium. Montgomery College is part of the Howard Consortium. Four community colleges are part of the Sam Houston State calculus project. In addition, many two-year colleges have adopted the reform calculus texts supported through the NSF Calculus Program. For example,

- 82 the 282 adopters of the Harvard Calculus Consortium materials are at community colleges,
- 8 the 71 adopters of the St. Olaf materials are at community colleges,
- 4 of the 40 adopters of the Purdue materials are at two-year colleges and one of the prime developers of that project (Keith Schwingendorf has recently moved to a two-year college which is part of the Purdue system), and
- community colleges represent about half of the 50 college adopters of the Oregon State materials.

Leadership Opportunity in Science and Humanities Education

The Division of Undergraduate Education, the National Endowment for the Humanities Division of Education (NEH), and the Department of Education's Fund for the Improvement of Post-Secondary Education (FIPSE) have established the Leadership Opportunity in Science and Humanities Education (CCD-LOSH). The program seeks projects for the development of undergraduate courses and curricula that meaningfully link the study of science and the humanities. For example, Nassau Community College on Long Island is developing an activity centered multidisciplinary science course for non-science students. El Paso Community College and the University of Texas at El Paso continue to develop an interdisciplinary course in science, its history, and cultural implications.

ADVANCED TECHNOLOGICAL EDUCATION IN TWO-YEAR COLLEGES

In order to ensure quality technical education for students in associate degree granting institutions who seek two-year degrees as science and engineering technicians, the Division of Undergraduate Education has funded projects that

- improve the basic mathematics and science understanding and skills for all students; and

- provide specialized engineering and science skills for students in advanced technician degree programs.

This year a total of 317 preliminary proposals for 76 centers and 241 projects requesting about $450,000,000 as well as 33 formal proposals for planning grants for centers requesting about $1,800,000 were received by the November 1, 1993 deadline. Around $14.6 million will be available to support these activities which will permit support of approximately 2 to 5 centers, 10 to 15 planning grants for centers, and 30 to 40 projects. Preliminary proposals were received from 45 states plus Puerto Rico and the District of

Columbia. There was a good balance of male and female principal investigators as well as those of varied ethnic backgrounds. Proposals that were highly rated demonstrated collaboration of two-year colleges with secondary schools and four-year institutions. Intellectual partnerships with business, industry, and government were featured. Specific policies for articulation were included. Activities are being led by those with expertise in scientific and technical fields. Commitments of partners were described. Proposals that included new instructional strategies demonstrated the need and the market. Principal investigators have proven expertise to carry out proposed tasks.

Workshops to assist faculty and administrators at two- and four-year colleges and universities as well as secondary school teachers and administrators interested in technician education are being held in conjunction with national meetings as well as at some institutions in areas of the country that have a high concentration of community colleges. These outreach activities are being conducted by the staff in DUE and ESIE to familiarize the community with the ATE program and to increase the quality of proposals to the program.

TABLE 10

ADVANCED TECHNOLOGICAL EDUCATION 1993 AWARDS TO TWO-YEAR COLLEGES (PRIOR TO FORMAL ATE PROGRAM)

	ILI		CCD		TOTALS	
Computer Science	2	144,385			2	144,385
Engineering	7	452,594	2	395,395	9	847,989
Inter-disciplinary			1	115,000	1	115,000
Physics	1	98,833			1	98,833
Totals	10	$695,812	3	$510,395	13	$1,206,207

In FY'92, there were 21 awards totaling $949,847 to two-year colleges that were aimed at advanced technological programs; all awards were in the ILI program.

NOTES ON SOURCE OF DATA

The data provided in Tables 1 through 7 came from the NSF Main Database and from sub-contracts, when available, to two-year colleges. Summaries include awards where either the principal investigator or a co-principal investigator was from a two-year college. All awards made by the Division of Undergraduate Education to two-year colleges were cross referenced by the abstracts of those awards.

The data provided in Tables 8 and 9 came from information provided by the principal investigators of Undegraduate Faculty Enhancement projects.

The data provided in Table 10 were taken from the abstracts of advanced technological education awards in 1993 to two-year colleges prior to initiation of formal ATE program.

DIVISION OF UNDERGRADUATE EDUCATION (DUE)

NATIONAL SCIENCE FOUNDATION
ROOM 835
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230
703-306-1668

DUE AWARDS FOR TWO-YEAR COLLEGES 1993

CALCULUS
COURSE AND CURRICULUM DEVELOPMENT
INSTRUMENTATION AND LABORATORY DEVELOPMENT
LEADERSHIP IN LABORATORY DEVELOPMENT
UNDERGRADUATE FACULTY ENHANCEMENT

**T INDICATES EMPHASIS ON ADVANCED TECHNOLOGICAL EDUCATION

ATMOSPHERIC SCIENCES

ID#: 9351390
PI Name: Paul L. Sirvatka
PI Institution: College of DuPage, Glen Ellyn, IL
FY 93 Award: $24,002
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Promoting Student Involvement in Meteorology Laboratory Through the Installation of a Local Area Network and Data Display Equipment

This project is involving students with methods of data as simulation and presentation early in their study of meteorology. A Local Area Network (LAN) is being established to facilitate optimum acquisition of data and to allow for student access to the LAN and all its data. A RISC Workstation, three PCs and a laptop PC are providing the core of the LAN, while a laser printer and a video projection system are allowing for effective presentation. The proposed equipment is enabling majors and non-majors to immerse themselves in laboratory experiences that are supplementing classroom instruction in every course in the meteorology curriculum. Practical operation with emphasis on forecasting and investigation of current research findings is heightening students' critical thinking ability and instilling the process of scientific thinking into the educational experience. Students also are having the opportunity to apply the skills learned in laboratory in cooperation with forecasting done by the Northeast Illinois Severe Weather Spotter Network.

CHEMISTRY

ID#: 9154191
PI Name: Richard F. Jones
PI Institution: Sinclair Community College, Dayton, OH
Co-PI Name: C. Duane Sell
Co-PI Institution: William Rainey Harper College, Palatine, IL
Co-PI Name: R. Gerald Keil
Co-PI Institution: University of Dayton, Dayton, OH
FY 93 Award: $174,154
Program: Undergraduate Faculty Enhancement
Award Effective Date: 1992-01-01
Award Expiration Date: 1994-06-30

Instrumentation Workshops for Two-Year College Chemistry Faculty

Two week workshops in chemical instrumentation for 36 two year college faculty provide participants the opportunity to explore modern instrumental techniques and their applications in introductory courses. One week is spent on each of two instrument groups selected by the participant. Options include: atomic absorption and flame emission, Fourier-transform infrared spectroscopy, vapor phase chromatography, high performance liquid chromatography, nuclear magnetic resonance spectroscopy, gas chromatography/mass spectroscopy, and computerized data acquisition. Date: Summers 1992 and 1993.

ID#: 9350682
PI Name: William R. Bornhorst
PI Institution: Grossmont College, El Cajon, CA
Co-PI Name: Cary Willard
Co-PI Institution: Grossmont College, El Cajon, CA
Co-PI Name: Charles D. Park
Co-PI Institution: Grossmont College, El Cajon, CA
Co-PI Name: John R. Maley
Co-PI Institution: Grossmont College, El Cajon, CA
Co-PI Name: William Givens
Co-PI Institution: Grossmont College, El Cajon, CA
FY 93 Award: $23,576
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-15
Award Expiration Date: 1995-12-31

Enhancement of the Chemistry Laboratory Curriculum using Computer Data Acquisition

This project is improving the instructional program by the establishment of a computer data-acquisition laboratory, consisting of sixteen personal computers and SciTech data acquisition interfaces, to make all of the electronic measurements required in a lower division college chemistry class. The laboratory systems are tied to the existing department and campus Novell network by upgraded NetWare 3.11 software and a dedicated 486 file server. Experiments are designed to enhance discovery exercises to enable students to investigate phenomena and perform calculations rapidly and transparently to look for trends and inconsistencies in experimental data to shift the focus to one of exploration. The emphasis of the laboratory will be to improve laboratory skills, learn chemical concepts, design experimental procedures, experiment like a scientist, and produce meaningful results and reports.

ID#: 9350851
PI Name: Victoria M. Bragin
PI Institution: Pasadena City College, Pasadena, CA
FY 93 Award: $19,459
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-11-30

The Next Step To Visualizing the Chemistry Curriculum

This project aims to reform the chemistry curriculum and increase retention through hands-on student use of visualization computers in introductory chemistry courses. Wide variation in ability to comprehend concepts, poor college preparation and inadequate writing and language skills of many students, demand that concepts be presented in an engaging fashion so as to allow immediate grasp of principles regardless of the students' background. Customized applications are being quickly and easily developed by combining courseware already written by the author with the large amount of shareware available at public archive sites and commercial software such as Mathematica, Interface Builder, and Renderman. This interactive courseware is being used to illustrate abstract concepts and model complex phenomena. Students explore the effect of changing parameters on a variety of complicated chemical systems. Pre-lab exercises using computer simulations familiarize students with equipment and laboratory protocols before performing experiments. Students electronically mail data and lab reports, with graphics and sound annotations as well, and receive the instructor's voice- annotated and written comments in return.

ID#: 9350983
PI Name: Sandra Etheridge
PI Institution: Gulf Coast Community College, Panama City, FL
Co-PI Name: Vicky D. Ellis
Co-PI Institution: Gulf Coast Community College, Panama City, FL
FY 93 Award: $40,000
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Doing More With Less: Instrumentation

The project uses computer simulation to provide students with experience with IR, NMR, and mass spectrum analysis. This is particularly advantageous in this community college environment where the costs of sophisticated instrumentation is prohibitive. Using interactive multimedia computers, the investigators are developing videodiscs containing both full motion video and still images as well as interactive courseware to teach proper sampling and instrumentation techniques. Properly designed interactive multimedia is a proven instructional method that works in teaching sampling and instrumentation techniques.

ID#: 9351346
PI Name: Christine M. Russell
PI Institution: College of DuPage, Ann Arbor, MI
FY 93 Award: $13,900
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-11-30

Enhancing Conceptual Understanding And Problem Solving Skills In The Organic Chemistry Laboratory

The project is enhancing students' conceptual understanding of organic chemistry, developing students' scientific problem solving skills, and increasing students' enjoyment of science using an adaptation of the discovery approach of the new University of Michigan organic chemistry sequence to a format suitable for a suburban community college. The key modification is the provision for a more supportive environment to encourage and motivate a very diverse student population. Computer based tools are being used to provide conceptual organization and structure to laboratory work and to establish stronger links between the lecture and laboratory. The computer based organizational shell combines visualizations of molecular models and mechanistic animations with spectroscopic data and laboratory observations to help students build mental models of chemical phenomena based upon how chemists think at the molecular level. In classroom and laboratory lectures, faculty routinely use computer displays to illustrate basic concepts of organic chemistry and to show the inter- relationships between theory and experiments. Students use the software in the laboratory to better understand the underlying concepts, experimental design, and analysis of instrumental data.

ID#: 9351485
PI Name: David N. Barkan
PI Institution: Northwest Community College, Powell, WY
FY 93 Award: $13,808
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-01
Award Expiration Date: 1995-12-31

FTIR Spectroscopy In An Introductory Chemistry Curriculum

Acquisition of a FTIR spectrophotometer is allowing the introduction and development of hands-on instrumental structural analysis in the organic laboratory. The FTIR and associated software also provides the students with computer assisted data collection, manipulation, and spectral data base searching. Organic Chemistry students use the instrument to identify unknowns, follow reaction progress, identify products, and help establish purity of synthesized compounds. General Chemistry students use the instrument to identify functional groups in introduction to Organic Chemistry. The project is helping overcome a major deficiency in the current laboratory curriculum by introducing the students to FTIR techniques that are widely used in Chemistry.

ID#: 9351593
PI Name: Margaret M. Suerth
PI Institution: Illinois Valley Community College, Oglesby, IL
Co-PI Name: Joseph Schoeb
Co-PI Institution: Illinois Valley Community College, Oglesby, IL
FY 93 Award: $13,206
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

Improving Chemistry Instruction with an FT-IR System

This project is increasing the scientific literacy of students by allowing them to experience the excitement and power of technological advances in chemical instrumentation and improve chemistry education on all levels by providing instruction and increasingly consistent use of the type of chemical instrumentation used routinely in the chemical profession. A Fourier Transform Infrared (FTIR) Spectrometer System is being used. At each course level students are being introduced to infrared (IR) spectroscopy theory at a slightly deeper level and are getting experience in using the instrument. The non-majors in the introductory course are being taught the very fundamental concepts of IR spectroscopy and are doing grouping studies of IR spectra they produce from thin film polymers they bring to the laboratory. Students in the preparatory chemistry course, general chemistry, and organic chemistry progress through increasingly higher levels of instrumental operation, techniques of sample preparation, including attenuated internal reflectance and diffuse reflectance, spectral interpretation, structural identification, data base searches, data acquisition and manipulation, and spectral storage. They do both qualitative and quantitative analysis.

ID#: 9352539 **T
PI Name: Steven Radak
PI Institution: Miami Dade Community College, Miami, FL
Co-PI Name: Alberto A. Gonzalez
Co-PI Institution: Miami Dade Community College, Miami, FL
Co-PI Name: Marvin S. Richards
Co-PI Institution: Miami Dade Community College, Miami, FL
Co-PI Name: Rasma Derums
Co-PI Institution: Miami Dade Community College, Miami, FL
Co-PI Name: Winston Strachan
Co-PI Institution: Miami Dade Community College, Miami, FL
FY 93 Award: $18,714
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

Curriculum Development of Laboratory Courses through High Pressure Liquid Chromatography

This project is purchasing a High Pressure Liquid Chromatography (HPLC) instrument for use in the teaching of organic chemistry, analytical chemistry, and other related fields. Emphasis is on practical applications as well as training for those students who will enter the industrial sector as technicians. The technical training emphasizes both the job related basic skills of being able to operate a variety of modern laboratory equipment, as expected of a technician, in addition to the basic research skills needed for a student to successfully pursue a professional degree in science.

ID#: 9352717
PI Name: Milton D. Gilmore
PI Institution: South Suburban College-Cook County, South Holland, IL
Co-PI Name: Diane M. Ostojic
Co-PI Institution: South Suburban College-Cook County, South Holland, IL
Co-PI Name: Lucette Held
Co-PI Institution: South Suburban College-Cook County, South Holland, IL
FY 93 Award: $13,025
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

Instrumentation to Improve Undergraduate Chemistry at a Community College

This institution is acquiring a GC and FTIR with plotters for the undergraduate chemistry program. Laboratory experiences are being emphasized which utilize the requested equipment to bridge theoretical concepts with practical applications. A useful by-product is student exposure to computer databases as well as an improved understanding of the FT function. Greater success in transfer students' adaptability to the four- year college laboratory experience is a major objective of the project. In addition, district science teachers benefit from hands-on experiences in SSC sponsored workshops.

ID: 9350743
PI Name: Nathan Viswanathan
PI Institution: PA State University, Fayette Campus
FY 93 Award : $11,067
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date : 1996-01-31

Improvement And Updating Of Organic/General Chemistry

The project is providing an FT Infrared spectrophotometer to develop new directions in the chemistry curriculum. This includes the introduction of microscale laboratory techniques in the 1) organic chemistry, 2) general and introductory chemistry, and 3) special problems and research in chemistry courses for the freshmen and sophomore level students. The instrument with its built in computer enables students to build libraries of spectra, identify impurities in the synthesized chemicals, perform baseline corrections, subtract solvent spectra and carry out computer searches in a relatively short time.

ID#: 9351403
PI Name: Philip K. Hall
PI Institution: University of Wisconsin Center, Marshfield, WI
FY 93 Award: $14,861
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1995-07-31

Chemistry Laboratory and Curriculum Improvement For Freshmen-Sophomore Instruction At UW Center-Marshfield/Wood County

The project is providing visible spectrophotometers for use in the freshman course as well as Fourier transform infrared (FT- IR) spectrometer for the freshman and sophomore organic course. This equipment allows a major upgrade in the chemistry offering at this two year college. This is part of a continuing effort, begun in 1989 to upgrade the chemistry curriculum and includes the introduction of microscale experiments enhanced by this instrumentation

COMPUTER SCIENCE

ID#: 9351287 **T
PI Name: Craig Bodkin
PI Institution: Trident Technical College, Charleston, SC
Co-PI Name: Eugene B. Straub
Co-PI Institution: Trident Technical College, Charleston, SC
Co-PI Name: James M. Rhodes
Co-PI Institution: Trident Technical College, Charleston, SC
Co-PI Name: Robert L. Hobday

Co-PI Institution: Trident Technical College, Charleston, SC
FY 93 Award: $44,385
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-11-30

Computer Networking: Local And Remote Telecommunication

This project is using a two-phase plan focusing on the development of instructional and laboratory techniques to deliver training in computer networks. The first phase is designed to identify courses for the program of study and to introduce basic networking experiments into the curricula. Trident is using NSF funding for the second phase to expand the laboratory capability to include experiments in most of the networking techniques used in manufacturing and business distributed computing. The College is utilizing NSF funds for the purchase of hardware and software technology that enhances the hands-on approach, and expands networking competencies in the program of study. Steps for Phase II include purchasing and installing hardware and software requested; integrating networking concepts and laboratory exercises into second year courses in the second year of the curriculum, assuring students have basic networking competency; developing and implementing laboratory exercises in the certificate and associate degree programs in Information Systems; and conducting an ongoing evaluation.

ID#: 9351488 **T
PI Name: Herman J. Wright
PI Institution: Wake Technical Community College, Raleigh, NC
Co-PI Name: Sunny T. Christensen
Co-PI Institution: Wake Technical Community College, Raleigh, NC
Co-PI Name: Vincent Revels
Co-PI Institution: Wake Technical Community College, Raleigh, NC
FY 93 Award: $100,000
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

Scientific Visualization Computer Graphics Technology Associate Degree Program

Wake Technical Community College of Raleigh, North Carolina, is establishing a curriculum to provide education and training to area adults and non-traditional students (minority adults, women in transition and re-entry, and employed or unemployed adults seeking retraining) who wish to learn the techniques and applications of scientific visualization computer graphics. This program, designed by the originator and several of the teachers of the highly successful Parkland College of Illinois program, blends mathematics, physical and computer sciences with art and humanities in a unique and powerful new way. It is necessary to revise and upgrade the first program's structure and curriculum to take into account the greater and more diverse local employment needs of the four area universities (UNC, NC State, Duke, and NC Central) and the major high technology firms in the Research Triangle Park area counties. A recent feasibility study in this tri-county area found over 225 potential positions that employers would create if graduates of such a associate degree program were available to hire. By all accounts, this is a conservative estimate of the growing demand in this field. In designing the new curriculum, consideration is being given to area demographics, the availability of local and non-local expertise, recent updates in available graphic software and hardware technology, and the fact that no formal undergraduate training now exists in North Carolina for scientific computer visualization graphics. This is a new field where, in most states, the demand for trained people far exceeds the number of qualified candidates. Thus, Wake Technical's curriculum

development is focusing on creating an effective educational model for establishing similar degree programs in other states by fostering collaborative efforts among local academic, industrial, and private sector resources. This project is establishing a state-of-the-art computer visualization laboratory crucial to the success of program.

ID#: 9351825
PI Name: Gerald R Smith
PI Institution: Northwest Community College, Tucson, AZ
FY 93 Award: $7148
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

Laboratory for Introductory Computer Science Sequence

A new laboratory component is being added to the introductory computer science sequence. A computer science facility is being established that will provide for an effective "closed" laboratory component to these courses. The project affects all the courses taught by the computer science department. New computer-servers are being added to the existing network and function as a computer science facility. Students taking computer science classes can access this facility from on and off campus. Material developed by previously and currently funded NSF projects is being used as much as possible in the development of the laboratories in this project. This provides the best laboratory software as quickly and as inexpensively as is possible. Every student taking computer science courses, both majors and non majors, has the opportunity to learn as much as they can and are being better prepared for transfer to other colleges and universities.

ENGINEERING INTERDISCIPLINARY

ID#: 9254172
PI Name: Katy Disney
PI Institution: Mission College, Santa Clara, CA
Co-PI Name: Charlotte E. Behm
Co-PI Institution: Mission College, Santa Clara, CA
FY 93 Award: $34,884
Program: Course and Curriculum Development
Award Effective Date: 1993-01-01
Award Expiration Date: 1994-06-30

Designing a Portable Technical Literacy Course for Use in California

This project is designed to increase the technical literacy and awareness of the general population of Mission College students through cooperation with regional colleges and universities as well as industry. The College is developing a course which is easily transportable throughout the State of California. A statewide network is currently in place through which the results can be quickly disseminated. Project activities include outreach to scientists and engineers in the community, collaboration with faculty in

various disciplines, visiting counterpart schools, researching topics, experimentation, and the construction of simple prototypes.

ID#: 9351683 **T
PI Name: Don P. Engelberg
PI Institution: CUNY Queensboro Community College, New York, NY
Co-PI Name: Tak David Cheung
Co-PI Institution: CUNY Queensboro Community College, Bayside, NY
FY 93 Award: $99,102
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Laboratory Upgrade in Telecommunication Applications of DFB Lasers and Erbium-doped Fiber Amplifiers for Technicians

This project is upgrading the laboratory component of optics by introducing current instrumentation related to setting up and testing erbium-doped fiber optical amplifiers and distributed feedback lasers. Students are characterizing the output of a distributed feedback laser by measuring its output power, linearity, central wavelength, and spectral width using power meters, monochromators, and scanning interferometers. They are assembling and testing an erbium-doped fiber amplifier (EDFA) system. Using a leveled sine-wave generator as a driving source or an LED and a DFB laser, appropriate detector and a wide bandwidth oscilloscope, they are measuring amplification and linearity of the EDFA for a range of signal strengths. They are also measuring bit error rate using a BERT driving a DFB laser source, sending a signal through a length of fiber with and without amplification by an EDFA. Finally, they are using two DFB lasers as sources to make a narrowly-spaced (in wavelength) wavelength division multiplexer which inputs its signal to an EDFA before the demultiplexing stage. All instruments are representative of those which a technician working with fiber optics uses.

ID#: 9351757 **T
PI Name: Bernard E. Mohr
PI Institution: CUNY Queensboro Community College, New York, NY
.Co-PI Name: Bruce R. Naples
Co-PI Institution: CUNY Queensboro Community College, New York, NY
Co-PI Name: Charles J. Spiteri
Co-PI Institution: CUNY Queensboro Community College, New York, NY
Co-PI Name: Henry Zanger
Co-PI Institution: CUNY Queensboro Community College, New York, NY
FY 93 Award: $55,918
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

A Connectivity Laboratory To Strengthen Engineering Technology

CUNY Queensboro Community College is implementing a Connectivity Laboratory -- a cornerstone for future engineering technology development and a model for other technology curricula. The laboratory is designed to support experiments in connectivity, data communications, network technology, and

multimedia networks. Six resource areas constitute the laboratory -- Student Stations, Instruction Resources, Connection Resources, Network Services, Multimedia Resources, and Display Resources. Four engineering technology courses are being scheduled to use the Connectivity Laboratory -- Connectivity Fundamentals, Network Fundamentals, Network Technology, and Multimedia Networks.Each laboratory bench has EISA and MCA bus computers which may be configured as workstations and fileservers, using Ethernet, Tokenring, or peer-to-peer Ethernet protocols. These may be interconnected into various network topologies using a lObaseT concentrator, multimedia access center, Ethernet bridge, fiber optic/Token- ring MAU, and a Token-ring bridge.

ID#: 9351872 **T
PI Name: Nicholas M. Massa
PI Institution: Springfield Technical Community College, Springfield, MA
Co-PI Name: Arvind Karnik
Co-PI Institution: Springfield Technical Community College, Springfield, MA
Co-PI Name: Margaret E. McCarthy
Co-PI Institution: Springfield Technical Community College, Springfield, MA
Co-PI Name: Peter D. Vangel
Co-PI Institution: Springfield Technical Community College, Springfield, MA
FY 93 Award: $53,255
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Optical Test and Measurement Laboratory to Enhance Electro-Optics Program

The Laser Electro-Optics Technology Department at Springfield Technical Community College (STCC) is enhancing its curriculum by acquiring an Optical Test & Measurement Lab with assistance from the National Science Foundation. The major instrument is the Zygo Mark IVxp Phase Measuring Interferometer. Interferometers have long been used for both macro and micro surface characterization in the fabrication and assembly of precision optical components and systems. The Zygo Mark IVxp Interferometer System represents the state-of-the-art in optical surface evaluation and is being used increasingly in a variety of measurement purposes in manufacturing and quality assurance. Access to such equipment by students is enriching the already diverse laser electro-optics offerings at STCC, one of but a handful of colleges in the country with a laser major. With the opportunity to engage in hands-on applications employing "real world" hardware in a laboratory setting, STCC students are being significantly better prepared to continue their studies at the university level and/or to pursue their technical careers in the private or government sectors.

ID#: 9352369 **T
PI Name: Donald Wade
PI Institution: SUNY Nassau County Community College, Garden City, NY
Co-PI Name: Frederick E. Schoenfeld
Co-PI Institution: SUNY Nassau County Community College, Garden City, NY
FY 93 Award: $47,785
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

The Integration of Computer-Based Data Acquisition into Electronic Technology

Computer based data acquisition and testing is becoming more and more prevalent in the field of electronics. Presently the electronic technology equipment at Nassau Community College consists exclusively of discrete, non-computerized measuring instruments. The project is incorporating data acquisition into the Electronics program at Nassau Community College through upgrading one of their two electrical measuring labs by the incorporation of state of the art computer-based "virtual" instruments. Students using this lab are being exposed to the concept of computer based data acquisition and computerized data analysis over the two years they are in the electronics program. The project builds the integration of the data acquisition equipment and analysis programs into every electronics course containing a laboratory portion. The students knowledge of data acquisition and analysis is being gradually expanded semester by semester as new aspects in this area are presented. Upon completion of the program the project equipment will allow the student to have a thorough understanding of data acquisition.

ID#: 9352459 **T
PI Name: Gaby N. Hawat
PI Institution: Valencia Community College, Orlando, FL
Co-PI Name: Farhan A. Faruqi
Co-PI Institution: Valencia Community College, Orlando, FL
Co-PI Name: Hugh Rogers
Co-PI Institution: Valencia Community College, Orlando, FL
Co-PI Name: Robert D. Pickman
Co-PI Institution: Valencia Community College, Orlando, FL
Co-PI Name: Thomas J. Bartoli
Co-PI Institution: Valencia Community College, Orlando, FL
FY 93 Award: $57,901
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-15
Award Expiration Date: 1995-10-31

Enhancing Computer Integrated Manufacturing in Undergraduate Education

Valencia is in the process of implementing a Computer Integrated Manufacturing (CIM) Training Facility to provide students with the opportunity to enhance their skills and to participate in applied research projects. The implementation includes acquisition, installation and testing of additional electronics equipment used in manufacturing and supported by curriculum revision. As a result of the additional equipment, students study a fully automated Surface Mount Technology (SMT) assembly process. The process can simulate almost any automated assembly or test requirement. Electronics Engineering Technology (EET) and CIM students at Valencia will, as a result of the additional equipment, be more independent in their critical thinking and decision-making in electronics engineering. Pre-engineering students on a professional career track will be able to enroll in courses that will teach the application of sophisticated instrumentation that will assist them in performing applied research and expand their vision for design potential, manufacturing potential, and quality potential.

ENGINEERING-ELECTRICAL

ID#: 9254187 **T
PI Name: Bernard E. Mohr
PI Institution: CUNY Queensboro Community College, New York, NY
Co-PI Name: Bruce R. Naples
Co-PI Institution: CUNY Queensboro Community College, New York, NY
Co-PI Name: Edward V. Chapel
Co-PI Institution: CUNY Queensboro Community College, New York, NY
Co-PI Name: Thomas J. Gerson
Co-PI Institution: CUNY Queensboro Community College, New York, NY
FY 93 Award: $303,395
Program: Course and Curriculum Development
Award Effective Date: 1993-02-15
Award Expiration Date: 1996-01-31

Engineering Technology Instruction for the 21st Century

This project is aimed at strengthening and modernizing academic preparation in Electrical and Computer Engineering Technology. Employers have increased academic hiring requirements commensurate with revolutionary developments and growth of emerging computer related technology. Minorities who are expected to account for a growing percentage of the workforce are grossly underrepresented in technical occupations. This exemplar project employs a comprehensive strategy to improve student mastery of engineering technology, heighten student academic participation and achievement, emulate an industrial workplace environment, and enhance academic and employment opportunities. Activities in two fundamentals laboratories are being restructured to foster improvements in the mastery of laboratory skills. Project activities include the design and development of online instructional resources on the departments' local area network, computer based data acquisition and analyses, and multimedia courseware for presentations and lectures. Also included in the activities is an extensive evaluation component and a national and regional program for dissemination of project methodologies and results.

ID#: 9351650 **T
PI Name: Alan M. Cocchetto
PI Institution: SUNY Technical Alfred, Alfred, NY
Co-PI Name: Charles W. Krebs
Co-PI Institution: SUNY Technical Alfred, Alfred, NY
FY 93 Award: $85,315
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1995-07-31

Instrumentation for Data Acquisition and Control

This project provides support facilities for an interdisciplinary instrumentation course that serves multiple Associate and Bachelor of Technology programs. It also improves the instruction of transducer principles and their extension to system applications. By providing students with an instrumentation workstation that functions with numerous built-in transducers in conjunction with data-acquisition hardware and advanced engineering software, basic instrumentation principles are demonstrated. Specifically, this project allows students:

- to acquire data from transducers in an automated fashion;
- to use their acquired data for further mathematical analysis;
- to use their acquired data as a stimulus for theoretical system model evaluations; and
- to use their acquired data to support real-time process control experiments.

Providing computer-based simulation tools for the evaluation of systems that are too complex to construct in the laboratory, or too expensive and time-intensive to implement in practice, allows students to expand their knowledge of basic course principles to those examples that encompass complex systems encountered in the workplace.

ENGINEERING-METALLURGY & MATERIAL

ID#: 9352731 **T
PI Name: George H. Sehi
PI Institution: Sinclair Community College, Dayton, OH
Co-PI Name: Alan Watton
Co-PI Institution: Sinclair Community College, Dayton, OH
Co-PI Name: Russell Marcks
Co-PI Institution: Sinclair Community College, Dayton, OH
FY 93 Award: $53,318
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

HVAC Research and Development Project

This project is directed at the design and development of a coordinated group of instructional laboratory apparatus to be used in student-conducted experiments to demonstrate and measure the operating characteristics, both steady-state and dynamic, of various types of heating, ventilating, and air conditioning control units and systems used in the HVAC systems of commercial buildings, auditoriums, schools, and other large- scale installations. This project is an extension to an initial effort, under local funding and industry support over the past two years, to develop a laboratory set-up for a student-conducted experiment to demonstrate and measure the steady-state and dynamic behavior of a typical single-loop control system controlling static air pressure in an air duct. This effort allows completing the design of the single-loop control system for air including adding a microprocessor-type control unit and the extension of the same approach to two other HVAC systems, specifically (a) A single loop control system for a hot-water coil and (b) A single-zone economizer cycle. This project will result in the attainment of a capability to challenge HVAC design students at the undergraduate level to apply basic control theory to the measurement and analysis of system behavior, using closed- and open-loop tests in both the time- and frequency-domains. An advisory board comprised of educators, members of appropriate technical societies, and industrial representatives are guiding the conduct of the project and actively participate in its evaluation. The results of the proposed project will be the subject of a two- day workshop on improved instruction in HVAC design, particularly with respect to control theory, to be hosted by the project management team. Publication of project results will be made at annual meetings of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) and the American Society for Engineering Education (ASEE).

ID#: 9254293 **T
PI Name: Frank A. Dolan
PI Institution: New Jersey Institute of Technology, Newark, New Jersey
Co-PI Name: James G. Hudgings
Co-PI Institution: Camden County College, Camden, New Jersey
FY 93 Award: $92,000
Program: Course and Curriculum Development
Award Effective Date: 1993-03-01
Award Expiration Date: 1994-08-31

Curriculum Development - Manufacturing Systems

This is a joint project of the New Jersey Institute of Technology as lead institution for the North/Central New Jersey and Camden County College as lead institution for the Southern New Jersey CIM Consortia. The consortia operates fully articulated programs aimed at the AAS and BSETdegrees in Manufacturing Engineering Technology. The consortia consists of 13 community colleges and NJIT in the North/Central; Camden County College, 5 other community colleges and NJIT in the Southern. Articulated curricula of the two consortia include a two course sequence in Manufacturing Systems. This sequence is critical to the success of the program. Significant deviations in course content and emphasis among the member colleges have been previously noted. This project solicits input from the manufacturing industry on required skills which should be attained through the first course of the two-course sequence. During a summer Curriculum Development Institute, selected faculty members are developing model curricula and training modules. The project also identifies possibilities for sharing of laboratory resources in support of the model.

GEOGRAPHY

ID#: 9352710
PI Name: Mark Greer
PI Institution: Laramie County Community College, Cheyenne, WY
Co-PI Name: Jim Johns
Co-PI Institution: Laramie County Community College, Cheyenne, WY
FY 93 Award: $15,079
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-15
Award Expiration Date: 1995-10-31

Geographic Studies Center

The primary purpose of this proposal is to design and implement a Geographic Studies Center as a model geography laboratory for Wyoming and northern Colorado. The Center engenders student and teacher interest in geography by demonstrating ways in which technological advances (computer graphics, high-quality videodiscs) are creating new learning opportunities in this field. Students at Laramie County Community College are the most immediate beneficiaries of this laboratory facility, but it also serves as an innovative model and inservice venue for educators and students throughout this region. Geography

teachers from Laramie County, professors from the University of Wyoming, and community college instructors are involved in the design and implementation of the Geographic Studies Center.

GEOLOGICAL SCIENCES

ID#: 9255487
PI Name: Dorothy Stout
PI Institution: Cypress College, Cypress, CA
FY 93 Award: $123,985
Program: Undergraduate Faculty Enhancement
Award Effective Date: 1993-03-15
Award Expiration Date: 1994-08-31

Project Update Geoscience

This three-week workshop emphasizes hands-on manipulative use of modern tools for classroom and field activities for faculty primarily engaged in teaching introductory geoscience courses. Topics to be considered include: the use of spreadsheets and databases in the classroom; computer assisted construction of illustrations, maps, and graphs; use of US Geological Survey materials such as GLORIA, JEDI, National snow and ice data, and the Ocean Atlas; earthquake modeling and analysis; volcanology; and, hydrologic management. Activities also include a field trip to Owens Valley for seismic analysis of the San Andreas Fault.

LIFE SCIENCE BIOLOGICAL

ID#: 9254228
PI Name: William B. Kincaid
PI Institution: Mesa Community College District, Mesa, AZ
Co-PI Name: Margaret A. Johnson
Co-PI Institution: Mesa Community College District, Mesa, AZ
FY 93 Award: $132,180
Program: Course and Curriculum Development
Award Effective Date: 1993-03-15
Award Expiration Date: 1994-08-31

Computer Applications to Enhance Inquiry-Oriented Laboratory Instruction in Biology at a Two-Year College

The general problem of scientific-technical literacy as well as the enhancement of inquiry-oriented laboratory instruction in biology is being addressed. Specific goals are to increase scientific literacy, reasoning skills, and the number of students succeeding in introductory biology courses. These goals are being achieved by developing, evaluating, and integrating into the curriculum a set of computer applications designed to reinforce biology concepts with laboratory activities. Efforts are focused on an

introductory biology course at a two-year college that serves a nontraditional undergraduate population. Student populations include women, Hispanics, Native Americans, and older students. The resultant inquiry-based model of laboratory instruction is being used as a model for computer technology in bio-science education.

ID#: 9255526
PI Name: Mary Sue Lowery
PI Institution: University of San Diego, San Diego, CA
Co-PI Name: Anne A. Struz
Co-PI Institution: University of San Diego, San Diego, CA
Co-PI Name: Shannon A. O'Dunn, El Cajon, CA
Co-PI Institution: Grossmont-Cuyamaca Community College
FY 93 Award: $114,066
Program: Undergraduate Faculty Enhancement
Award Effective Date: 1993-01-01
Award Expiration Date: 1994-12-31

Field Experiences in the Marine Sciences: Coastal Oceanography, Geology and Marine Biology of Southern California/Baja California

This three-week course offers 40 instructors of undergraduate marine sciences and related physical and biological science disciplines first hand exposure to California coastal marine environment. Participants are collecting and analyzing oceanographic data aboard the R/V Gordon Sproul, conducting field exercises in modern day mid-latitude marine habitats and an active continental margin tectonic terrain; developing laboratory exercises using satellite imaging; interacting with local experts in marine biology, fisheries management, geology, and physical oceanography; and participating in a choice of special topic mini-workshops.

ID#: 9351106
PI Name: Elizabeth Gibson
PI Institution: St. Johns River Community College, Palatka, FL
Co-PI Name: Elizabeth Rinker
Co-PI Institution: St. Johns River Community College, Palatka, FL
Co-PI Name: Jerome Rothschild
Co-PI Institution: St. Johns River Community College, Palatka, FL
Co-PI Name: Milton P. Speaks
Co-PI Institution: St. Johns River Community College, Palatka, FL
FY 93 Award: $6487
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-01
Award Expiration Date: 1995-12-31

Recombinant DNA Technology For Students In Science Classes and Workshops

Lectures and "hands-on" laboratory experiences in DNA science are being provided for students in general biology, microbiology, and in combined workshops for teachers and undergraduate students. Typical experiments revolve around DNA extraction, restriction enzyme analysis, separation of DNA fragments by agarose gel electrophoresis, and bacterial transformation.

ID#: 9351521
PI Name: Laurence W. Phelps
PI Institution: University of Wisconsin BarabooSauk, Baraboo, WI
Co-PI Name: Janet W. Phelps
Co-PI Institution: University of Wisconsin BarabooSauk, Baraboo, WI
FY 93 Award: $12,938
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-04-30

Computer Equipment to Improve Data Acquisition and Analysis in Biology Labs

The institution provides a liberal arts freshman and sophomore curriculum. More than half of the students are older and returning to school or are rural, first-generation college students. This project, therefore, provides computers and associated physiological recording equipment and software that helps undergraduate instruction in biology. The software programs developed are allowing faculty to prepare printed and Hypercard-based tutorial material custom-designed to the backgrounds of our students. This project is enhancing the laboratory experience of their traditional students and tapping the currently underutilized capabilities of the large non-traditional population at the institution.

ID#: 9351800
PI Name: William E. Camelet
PI Institution: Lake Michigan College, Benton Harbor, MI
Co-PI Name: Wilma M. Kime
Co-PI Institution: Lake Michigan College, Benton Harbor, MI
FY 93 Award: $23,062
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

Video Enhancement for Improving Microscopy

The laboratory experiences are being linked to the lecture presentation by incorporating laboratory video images into the computer assisted multimedia presentations. The multimedia presentation program has the flexibility to retrieve laboratory images for display at any point in the lecture. A computer driven video system enhances microscopy, dissection, demonstrations and experiments. The laboratory exercises are displayed live on the closed circuit video system, and selected segments are stored on computer disc or video tape for further analysis or review. The video system captures, stores and instantly retrieves rare microscopic motions and other unique laboratory observations. Images are enlarged, and then compared in split screen.

ID#: 9352014
PI Name: Virginia McDonald
PI Institution: St Louis Community College Meramec, Kirkwood, MO
Co-PI Name: Joseph Dunne
Co-PI Institution: St Louis Community College Meramec, Kirkwood, MO
Co-PI Name: Maureen Murphy
Co-PI Institution: St Louis Community College Meramec, Kirkwood, MO
Co-PI Name: Michael Aehle
Co-PI institution: St Louis Community College, Meramec, Kirkwood, MO
FY 93 Award: $33,926
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-09-01
Award Expiration Date: 1996-02-28

Interdisciplinary Development of Physiology Experiments

This project is using MacPacq data acquisition systems in their Anatomy and Physiology courses. These systems enable students to make physiological recordings and to produce lab guides using a cross - disciplinary approach. The lab recordings include standard measurements, such as electrocardiograms and lung volumes, and demonstrations of muscle and nerve responses to electrical stimulation. The computers are being used not only to familiarize students with basic physiology concepts, but also to instruct them in the manipulation, display, and interpretation of scientific data. They utilize a collaborative effort between Biology students, Technical Illustration students, and English Department staff in the production of laboratory guides for the equipment. These laboratory guides are being produced as Hypercard stacks that allow students to step through the processes of equipment set-up, data acquisition, and reporting of results. Producing these lab guides as an on-screen manual, and utilizing the talents of students and faculty in several different departments represents an exciting innovation in the use of this type of equipment. The equipment and laboratory guides are being demonstrated at the Women's Math and Science Network, at a local Middle School, and at the Missouri Community College Association annual meeting.

ID#: 9352230
PI Name: Sue S. Webber
PI Institution: Whatcom Community College, Bellingham, WA
Co-PI Name: Janice Lapsansky
Co-PI Institution: Whatcom Community College, Bellingham, WA
FY 93 Award: $7018
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

Improving Quantitative and Critical Thinking Skills in Introductory Biology

Improving Quantitative and Critical Thinking Skills in Introductory Biology in an introductory biology course to improve students' quantitative and critical thinking skills by conducting laboratory exercises requiring increased use of data collection, recording, analysis, and reporting. Microscopy laboratories include exercises requiring measuring, counting and estimating. Electrophoresis experiments separating DNA fragments are being incorporated into the regular laboratory schedule. Increased use of laboratory exercises focusing on cellular and molecular biology provide students better opportunities to utilize the tools of biology and connect biology with related disciplines such as chemistry. Students work in teams and utilize a collaborative learning methodology which extends to both lecture and small group weekly sessions.

ID#: 9352394
PI Name: Terese Dudek
PI Institution: Kishwaukee College, Malta, IL
Co-PI Name: Janice Grainger
Co-PI Institution: Kishwaukee College, Malta, IL
Co-PI Name: Laurie A. Folgate
Co-PI Institution: Kishwaukee College, Malta, IL
Co-PI Name: Terry Martin
Co-PI Institution: Kishwaukee College, Malta, IL
FY 93 Award: $8600
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

A Wetland Up Close: Field Study and Videomicroscopy in Marsh Analysis

A principal aim of this project is to assess the stability of a local wetland and to promote awareness of the need to preserve wetland ecosystems. Studies of this wetland ecosystem, therefore, are determining population densities and are providing data on diversity. This is a recently added a course in field biology to their curriculum and students in this course also participate directly in the research. Videotapes describing the life of the wetland are also being produced for use by the community. The project is providing additional education opportunities such as cooperative learning and independent study.

ID#: 9352505
PI Name: Lee F. Famiano
PI Institution: Cuyahoga Community College, Cleveland, OH
Co-PI Name: Anthony A. Miller
Co-PI Institution: Cuyahoga Community College, Cleveland, OH
Co-PI Name: Donald Wheeler
Co-PI Institution: Cuyahoga Community College, Cleveland, OH
Co-PI Name: Terri S. Pope
Co-PI Institution: Cuyahoga Community College, Cleveland, OH
FY 93 Award: $26,576
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-01
Award Expiration Date: 1995-12-31

Physiology Enhancement Project for Undergraduate Biology Students

Laboratory instruction using this equipment is being used to reinforce basic concepts and principles necessary for an understanding of physiology and also to develop and improve the students' critical thinking skills. Such laboratory experiences also produce more competitive transfer students as well as students who are better prepared for today's workforce.

ID#: 9352513
PI Name: William B. Kincaid
PI Institution: Mesa Community College District, Mesa, AZ
FY 93 Award: $41,869
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-11-30

Computing Equipment to Enhance Inquiry-Oriented Laboratory Instruction in Biology at a Two-Year College

The goals of this project are to facilitate the acquisition of biology concepts and cognitive skills in beginning biology students. Inquiry-oriented laboratory instruction of nonmajor, introductory biology students to include weekly computer applications are featured. The course is based on a 3-phase sequence of instruction including exploration, term introduction, and application. Traditional hands-on exploration activities, are supplemented with computer simulations.

MATHEMATICS

ID#: 9255850
PI Name: Dale Ewen
PI Institution: Parkland College, Urbana-Champaign, IL
Co-PI Name: Marilyn E. Mays
Co-PI Institution: North Lake College, Arlington, TX
Co-PI Name: Karen Sharp
Co-PI Institution: Mott Community College, Flint, MI
FY 93 Award: $80,515
Program: Course and Curriculum Development
Award Effective Date: 1993-05-01
Award Expiration Date: 1994-10-31

Curriculum and Pedagogy Reform at Two-Year Colleges: Moving Beyond Myths to Standards

The recent focus in the mathematical community on calculus and the development of the NCTM Standards for K-12 teachers is providing a framework to consider mathematics courses taught at two-year colleges and lower division mathematics courses taught at other institutions of higher education in this country. These courses are important elements in continuum and pipeline issues, as well as general mathematical needs of students not continuing in mathematically oriented fields of studies. The American Mathematical Association of Two-Year Colleges (AMATYC) is undertaking a leadership role in designing a framework for systemic reform of college mathematics in the curriculum leading to calculus. The first stage is a meeting of an AMATYC National Steering Committee consisting of leaders of AMATYC, MAA, and NCTM as well as others actively involved in the development of innovative mathematics curricula and Standards. In the second stage a small invited conference of a National Task Force is being held to establish guidelines for the development of a set of Standards for two-year college and lower

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division mathematics and to formulate a plan to build consensus for mathematics reform among two-year college and university constituencies.

ID#: 9254085
PI Name: Sheldon P. Gordon
PI Institution: SUNY Suffolk County Community College, Selden, NY
Co-PI Name: Bernard A. Fusaro
Co-PI Institution: Salisbury State University, Salisbury, MD
FY 93 Award: $149,917
Program: Course and Curriculum Development
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Filling the Tank: The Math Modeling/PreCalculus Reform Project

Materials are being developed for an innovative course in mathematical applications as a modern replacement for existing precalculus and related courses. The course is an introduction to mathematical models at the precalculus level and provides students with the skills and knowledge needed for calculus. The models developed in the course are primarily based on discrete mathematical topics such as difference equations, data analysis, probability, and matrix algebra. The course involves computer and/or graphing calculator work to investigate most of the mathematical models. It also involves a variety of live classroom experiments to investigate how well the mathematical models reflect actual processes or to help develop mathematical models based on observed experimental data. The course features a series of student investigations to provide a real- life dimension. It is designed to provide students with the motivation and impetus to continue on in mathematically related fields by exposing them to the wide applicability of mathematics.

ID#: 9254326
PI Name: Dennis Callas
PI Institution: SUNY Technical Delhi, Delhi, NY
FY 93 Award: $63,000
Program: Course and Curriculum Development
Award Effective Date: 1993-02-01
Award Expiration Date: 1995-01-31

Snapshots of Applications in Mathematics

In this project at least 100 short case studies or mathematical "snapshots" are being created. Each is designed to encourage appreciation of mathematics among under-achieving and under- motivated students. Following the compilation of these modules involving substantial library research and industry support, they will be class tested at several institutions. The project's short case studies differ from existing case studies (UMAP, COMAP, etc.). They require few prerequisites, are shorter, rely mainly upon oral presentation by instructors, and are adaptable to a broad range of textbooks. They are supplements to existing course work designed to motivate student interest in the subject matter and to show its relevance. Among the studies' goals is highlighting contributions of under-represented groups, thereby providing role models for students. The project is based upon preliminary work which yielded promising results. The studies are being drawn from a broad range of fields, all highlighting a "snapshot" of applied mathematics. After classroom testing, the project concept and results are being disseminated by a regional seminar. During this seminar, not only will participating instructors learn about the project and receive a booklet

containing the developed modules, but these faculty are also being provided the skills and knowledge necessary to design and implement studies for their classrooms.

ID#: 9255423
PI Name: Darrell H. Abney
PI Institution: University of Kentucky, Maysville, KY
Co-PI Name: Bart Braden
Co-PI Institution: Northern Kentucky University, Highland Heights, KY
Co-PI Name: Lawrence G. Gilligan
Co-PI Institution: University of Cincinnati Main Campus, Cincinnati, OH
AWARD AMOUNT: $169,981
Program: Undergraduate Faculty Enhancement
AWARD DATE: 1993-01-19

Calculus Institute Using Computer Algebra Systems

The Calculus Institute is introducing college mathematics teachers to computer algebra systems and to new methods of teaching calculus using computer algebra systems. This cooperative venture by two-year and four-year institutions, the American Mathematical Association of Two-Year Colleges (AMATYC), and the Kentucky Mathematical Association of Two-Year Colleges (KYMATYC) is focusing on calculus reform efforts in Kentucky. Laboratory manuals of participants' calculus materials and a position paper on transferability will be presented to AMATYC and KYMATYC for dissemination.

ID#: 9255537
PI Name: Denny L. Gulick
PI Institution: University of Maryland, College Park, MD
Co-PI Name: Eldon Baldwin
Co-PI Institution: Prince George's Community College, Largo, MD
Co-PI Name: Jon Scott
Co-PI Institution: Montgomery College, Takoma Park, MD
AWARD AMOUNT: $149,771
Program: Undergraduate Faculty Enhancement
AWARD DATE: 1993-01-13

Maryland Undergraduate Mathematics Enhancement Program (MUMEP)

The Maryland Undergraduate Mathematics Enhancement Program (MUMEP) supports a regional coalition of mathematics faculty from two- and four-year Maryland institutions in the region near the University of Maryland, College Park campus. Through workshops and seminars, MUMEP fosters communication among regional mathematics departments. A week-long workshop is being offered during each of the summers of 1993 and 1994, devoted to visual thinking in mathematics. Mathematics topics are chosen from chaotic dynamics and fractal geometry. Workshop participants are gaining hands-on experience working individually and in small groups. During each academic year following the respective summer workshop, regional seminars are being held in which participants continue the mathematical and curricular dialogue begun during the workshops.

ID#: 9255539
PI Name: Yves Nievergelt
PI Institution: Eastern Washington University, Cheney, WA
Co-PI Name: Caspar R. Curjel
Co-PI Institution: University of Washington, Seattle, WA
Co-PI Name: Gail Dieterich Nord
Co-PI Institution: Gonzaga University, Spokane, WA
Co-PI Name: Rose L. Pugh
Co-PI Institution: Bellevue Community College, Bellevue, WA
AWARD AMOUNT: $94,737
Program: Undergraduate Faculty Enhancement
AWARD DATE: 1992-11-24

The Geometry of Multivariable Calculus

The Geometry of Multivariable Calculus strengthens the multidimensional geometric intuition that students need, but usually lack, to understand multivariable calculus. To this end, community college and university instructors are participating in week-long workshops are designing geometric worksheets ready for use in existing courses ranging from elementary to advanced multivariable calculus to linear algebra. Workshops are taking place in Seattle and Spokane, with subsequent follow-up activities during the academic year. Introduced at the level of undergraduate courses, topics include splines in 1993 and differentials in 1994, with applications to aircraft design, computers, geographic maps, industrial engineering, orbital mechanics, and typography. Applications come from advance mailings, guest lecturers, and demonstrations of computational geometry from the Applied Geometry Corporation and the Boeing Company.

ID#: 9255869
PI Name: Rafael Martinez-Planell
Co-PI Name: Betty Ramirez
PI & Co-PI Institution: University of Puerto Rico Mayaguez, Mayaguez, PR
Some of the Collaborating Institutions Including all Two-Year Institutions in Puerto Rico: University of Puerto Rico at Ponce, Aguadilla, Arecibo, Antillan College, Interamerican University at San German, Aguadill, Arecibo, Catholic University of Puerto Rico
AWARD AMOUNT: $92,799
Program: Undergraduate Faculty Enhancement
AWARD DATE: 1993-01-14

Using Technology to Enhance the Teaching of Precalculus and Calculus

Each year for two years, a faculty enhancement program is being offered to 25 faculty members from a groups of universities and two-year colleges in Puerto Rico. As a short term goal, the program aims to introduce mathematics faculty members to the use of technology in the undergraduate mathematics classroom as a way of enhancing their teaching as well as the learning experiences of their students. Because the program is targeting academic institutions and students of modest economic means, there is a focus on technology which is relatively inexpensive. This will allow participating colleges and universities to implement what they learn on a large scale. The workshop is focusing on topics in precalculus and calculus. Follow-up activities are establishing a base for continued collaboration among participating institutions on issues concerning the use of technology and other curriculum matters

in undergraduate mathematics education. The program consists of three main activities: software workshops, graphic calculator workshops, and a conference cycle.

ID#: 9347219
PI: Henry Frandsen
PI Institution: University of Tennessee Knoxville, Knoxville, TN
2 YEAR Co-PI: Cheryl B. Slayden
2 YEAR Co-PI Institution: Pellissippi State Technical Community College, Knoxville, TN
AWARD AMOUNT: $86,589
Undergraduate Faculty Enhancement
Original AWARD #: 9154254
Supplement Award: $28,368

East Tennessee Consortium Professional Development Seminar for College Teachers of Mathematics

This regional consortium of two- and four-year colleges is conducting a week-long professional development seminar for college mathematics teachers in the East Tennessee area during the summer of 1992 followed by three week-end seminars in the 1992-93 academic year. The seminars are laboratory-based and are designed to introduce participants to discrete dynamical analysis, provide them with extensive opportunities on the use of calculators and computers for exploration and problem solving, and lead them to a continued interest in collaborative research and professional development. In addition, these seminars will provide opportunity and stimulation for cooperative development of new curricular materials and instructional techniques for the use of calculators and computers in the teaching of mathematics in post-secondary classes from the beginning levels through calculus.

This project is being supplemented in order to sustain the progress on this regional coalition of two- and four-year institutions in Tennessee. Eight teams of faculty from among the twenty institutions attending the original workshops are being chosen to receive $3000 minigrants to be used to purchase release time or summer support to continue with curriculum development and implementation of course material produced during and subsequent to the original workshops. Each team is submitting a written report and attending a follow-up meeting where they are reporting on their work.

ID#: 9347249
PI: Wade Ellis
PI Institution: California Mathematics Council Community Colleges, Saratoga, CA
2 YEAR Co-PI: Denny Burzynski
2 YEAR Co-PI Institution: West Valley College, Saratoga, CA
AWARD AMOUNT: $51,250
Undergraduate Faculty Enhancement
Original AWARD #: 9154294
Supplement Award: $12,308

Incorporating the Graphing Calculator into the Mathematics Classroom

Ten one day workshops are being presented to promote the immediate and widespread use of graphing calculators into the undergraduate mathematics curriculum. This project is providing 250 undergraduate math faculty with (1) detailed training on the mechanics of the calculator, (2) ideas as to how the calculator can be used in specific courses, (3) the opportunity to develop instructional materials for those courses, and (4) the opportunity to share their experiences with colleagues. The four member project team is visiting 10 community college campuses to give these workshops to interested two- and four-year college mathematics

faculty. Each participant is receiving a TI-81 graphing calculator and each institution a calculator projector kit to encourage instructors to continually explore potential uses of graphing calculators in mathematics instruction. The project directors are creating, editing, and publishing a newsletter, and three follow- up meetings are scheduled so that participating faculty can share their experiences.

This supplement is providing funds for a second tier of leaders. Five sites from among the ten original sites are being selected to be given release time to run bi-weekly graphing calculator workshops at their own institutions. These workshops are designed to encourage all mathematics faculty at these institutions to incorporate technology into their mathematics classes in effective ways to improve student understanding and learning of mathematics. The principal investigators are visiting each institution, organizing a dissemination and evaluation workshop at the annual meeting of the California Mathematics Consortium of Community Colleges, and disseminating a report on the workshops to all institutions involved.

ID#: 9350992
PI Name: Myrna Mitchell
PI Institution: Pima County Community College, Tucson, AZ
Co-PI Name: Mickey Hofmann
Co-PI Institution: Pima County Community College, Tucson, AZ
FY 93 Award: $31,856
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-01
Award Expiration Date: 1995-12-31

Computer Enhanced Learning In Mathematics

Students can be passive in their approach to learning mathematics, and they too frequently are unmotivated to expend much effort on learning this subject because they fail to see the relevance, importance, and power of mathematics. This project is actively involving students in the process of learning, and giving them a feel of the potential effect of mathematics on their lives. In order to do this, they are establishing a networked computer classroom/laboratory dedicated to mathematics. This is enabling students to learn by discovery instead of by memorizing facts, to concentrate on concepts instead of the details of arithmetic, to interact with one another and the mathematics instead of struggling alone or withdrawing from the situation, and to receive immediate attention from the instructor-via the network eye instead of only discovering that their work is in error later, while doing their homework or on an exam.

ID#: 9351478
PI Name: Linda H. Boyd
PI Institution: DeKalb College, Clarkston, GA
Co-PI Name: Charles Stone
Co-PI Institution: DeKalb College, Clarkston, GA
Co-PI Name: Sharon Sanders
Co-PI Institution: DeKalb College, Clarkston, GA
Co-PI Name: Sue Henderson
Co-PI Institution: DeKalb College, Clarkston, GA
FY 93 Award: $64,770
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Enhancing Calculus Instruction Through The Use Of Technology In Laboratories

Increasing the number of students, particularly the under-represented groups of non-white and female students, who major in mathematics and science is essential to the economic well- being of our country; and success in calculus is essential to majoring in mathematics and science. Engaging students in calculus courses when they work in small groups, explore mathematics with the use of technology, and produce a final product of which they can be proud is attracting many students who have not previously been attracted to mathematics or science. DeKalb College has a student population that is 29% non-white, and female students outnumber male students in a ratio of three to two. To provide calculus courses which open the door to the year 2000 and beyond for these and other two- year college students, this project is incorporating technology-based laboratories in DeKalb's calculus courses. These laboratories are actively engaging students in doing mathematics, and constructing coherent written arguments to support their laboratory findings is helping these students form and understand important underlying mathematical concepts. Another advantage to two-year college students of technology- based laboratories is that it forces them to become members of laboratory groups, to meet outside of class, and to become familiar with available technology. Most students who attend residential colleges have these experiences, while students commuting to college and working part-time usually study alone and away from the campus. To accomplish the goal of providing technology-based laboratories in calculus courses, the project is providing four computer laboratories. DeKalb College is supporting workshops for faculty to select and modify laboratory materials and to train the faculty in the use of Mathematica. Local high school teachers of AP calculus and an advisory team of faculty from sister senior institutions are involved in the workshops. This provides valuable bridges for our college and its students as they progress from high school, to two-year college, to other colleges and universities.

ID#: 9351645
PI Name: James Daniels
PI Institution: Palomar College, San Marcos, CA
Co-PI Name: Shannon Lienhart
Co-PI Institution: Palomar College, San Marcos, CA
Co-PI Name: Wendy Metzger
Co-PI Institution: Palomar College, San Marcos, CA
FY 93 Award: $44,055
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Transition To Calculus

This project is expanding a pilot program developed by two of the co-principal investigators to enhance the mathematics curriculum at Palomar College with computer technology. Preliminary laboratory materials were developed for teaching one section of College Algebra and one section of Calculus I with a computer laboratory component during the spring 1992 semester. This project is providing the resources to continue that curriculum development and expand to other College Algebra, Precalculus, and Calculus I sections. Macintosh computers and associated peripherals are being used to provide a laboratory component for College Algebra, Precalculus, and Calculus I courses offered by the college. The computers are empowering students to simultaneously represent functions in numeric, symbolic and graphic form. Students can visualize mathematical concepts without the need for excessive preliminary concentration on rote manipulation. Students concentrate on learning concepts through guided discovery, using problem solving strategies, and becoming familiar with how mathematics is done outside the classroom. The laboratory environment is requiring students to work collaboratively and write about the mathematics they are learning.

ID#: 9351656
PI Name: Scott A. Guth
PI Institution: Mount San Antonio College, Walnut, CA
Co-PI Name: Joan Sholars
Co-PI Institution: Mount San Antonio College, Walnut, CA
FY 93 Award: $22,920
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-15
Award Expiration Date: 1995-10-31

Mt. San Antonio Mathematics Laboratory Project

The aim of the Mt. San Antonio College Mathematics Laboratory Project is to revitalize Intermediate Algebra instruction by restructuring the Intermediate Algebra curriculum, modernizing course content, introducing weekly computer-based laboratory sessions into the course, and providing students with regular classroom computer mathematics demonstrations. The approach will eventually be expanded to include most mathematics courses. Students involved are being tracked, and an in depth study is being conducted to evaluate the effectiveness of the approach. A project implementation manual is being developed and distributed to all California community colleges. This project is significant because it addresses one of the most pressing issues facing community colleges today: the high attrition rates and poor achievement levels in lower division college mathematics.

ID#: 9351939
PI Name: Pat Juelg
PI Institution: North Harris County College, Houston, TX
Co-PI Name: Diane Murray
Co-PI Institution: North Harris County College, Houston, TX
Co-PI Name: Jim Polito
Co-PI Institution: North Harris County College, Houston, TX
Co-PI Name: Judy Dickson
Co-PI Institution: North Harris County College, Houston, TX
Co-PI Name: Judy Taylor
Co-PI Institution: North Harris County College, Houston, TX
FY 93 Award: $19,228
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

Technology in the Mathematics Classroom

This project is bringing today's technology into the mathematics classrooms at North Harris College and giving their instructors the opportunity to enhance and expand instruction techniques and teaching philosophies. They are bringing technology into the classroom by: 1) placing, in each of five classrooms, a computer that projects its images through a projection panel hooked to a cool-running projector and Personal Science Laboratory (PSL) Explorer software and hardware, 2) having available five classroom sets of TI-85 graphics calculators with overhead viewers. Their primary goal is to incorporate technology into every mathematics course, not just as a drill and practice, but also as an innovative tool for discovery, enrichment, deep thinking, and understanding which allows for a variety of approaches to learning.

ID#: 9352046
PI Name: King W. Nicholson
PI Institution: Central Alabama Community College, Alexander City, AL
FY 93 Award: $13,546
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

Combining Experiments with Lectures in Calculus and Physics

Students are utilizing the concepts of calculus to solve applied problems in both calculus and physics. The instructional approaches are modeled after the methods developed by Priscilla Laws, Ron Thornton, Alan Van Heuvelan, David Maloney, and others, to teach physics. The approaches also involve stressing the graphical, numerical, and analytical aspects of calculus in keeping with the ideas forwarded by the Harvard Based Calculus Consortium. An important aspect of this method of teaching is a set of short, simple conceptual experiments whose outcomes are recorded and graphed in real-time by a computer. Concepts are first developed qualitatively using experiments and their graphs, then quantitatively through mathematical representation of physical phenomena, and finally with overview case study problems.

ID#: 9352076
PI Name: Karla Foss
PI Institution: Pellissippi State Technical Community College, Knoxville, TN
Co-PI Name: Cheryl B. Slayden
Co-PI Institution: Pellissippi State Technical Community College, Knoxville, TN
FY 93 Award: $35,000
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-11-30

Technology for Improvements of Mathematical Concepts and Initiation to Professional Tools

Computer technology is being used in calculus and statistics courses to enable students to readily visualize mathematical concepts. The learning of the concepts is the primary focus, rather than the manipulation of symbols. Guided discovery and problem solving strategies enable students to develop deeper understandings and stronger intuitions of the material. The technological tools available to today's work force are being incorporated into the mathematics curriculum, better preparing students for future employment.

ID#: 9352243
PI Name: Donald Cohen
PI Institution: SUNY A&T College Cobleskill, Cobleskill, NY
FY 93 Award: $16,339
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-05-31

A Computer Laboratory/Classroom For Precalculus And Calculus Classes

The Mathematics Department at SUNY College of Agriculture and Technology at Cobleskill is establishing a computer laboratory/classroom for regular class scheduling of all precalculus and calculus classes. This classroom is allowing students to learn mathematics using a "hands-on" approach. The Harvard Calculus Consortium Project materials are being used to teach Calculus I and II at Cobleskill. Selected exercises from the Harvard materials are also supplementing the precalculus classes while other precalculus lessons are being written or modified from other projects. The faculty are attempting to modernize all of their course outlines by using the types of presentations and exercises given in the Harvard materials. While no specific technology is required for these materials, this project is creating a computer laboratory/classroom that includes the CAS software Derive. Such software allows the student to do numerical problems, graphs, and closed-form algebra and calculus very efficiently. Thus, the students are learning by doing mathematics throughout the class instead of just watching the teacher. In addition, the computers are available for in-class and out-of-class laboratory projects. These projects are designed to present "real" mathematical situations.

ID#: 9352334
PI Name: Joseph Barrick
PI Institution: St. Gregory S College, Shawnee, OK
Co-PI Name: Charles Buckley
Co-PI Institution: St. Gregory S College, Shawnee, OK
FY 93 Award: $27,355
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-01
Award Expiration Date: 1995-12-31

Computer-Equipped Classroom To Implement Curricular Reform In Mathematics

St. Gregory's College is a) equipping two classrooms with computers so that the students may test their insights immediately, use the power of graphing to reinforce mathematical concepts, and make approximation and use algorithmic thinking components in all mathematics courses at St. Gregory's College; b) transforming the mathematics curriculum by stages so that all mathematics courses will be taught in a classroom involving computer use and according to a syllabus that emphasizes mathematical concepts, graphing, algorithmic solutions, and approximation; c) utilizing these classrooms as mathematics laboratories at times when they are not used for classes; d) providing laboratory experiences in the physical and life sciences by computer that are not feasible with the equipment available in the laboratories.

ID#: 9352421
PI Name: Bruce Sisko
PI Institution: Belleville Area College, Belleville, IL
Co-PI Name: Michael Schneider
Co-PI Institution: Belleville Area College, Belleville, IL
Co-PI Name: Thomas L. Cochran
Co-PI Institution: Belleville Area College, Belleville, IL
FY 93 Award: $40,809
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

Macintosh Computer Lab Supporting Mathematica in Computer Integrated Calculus

Belleville Area College is developing a computer-aided calculus program to increase student involvement and introduce students to the technology (hardware and software) they will be required to use in their professions. Students are being challenged to become active participants as they use Mathematica to understand the concepts and ideas of calculus. Computers are being used by calculus students in directed laboratory classes to reinforce the concepts and ideas of calculus. As Mathematica performs the tedious calculations, students are developing an insight and appreciation of calculus. "Real world" problems are being stressed as students become proficient with the tools of their future.

ID#: 9352553
PI Name: Mark R. Parker
PI Institution: Shoreline Community College, Seattle, WA
Co-PI Name: Betty Hawkins
Co-PI Institution: Shoreline Community College, Seattle, WA
Co-PI Name: Carl Main
Co-PI Institution: Shoreline Community College, Seattle, WA
Co-PI Name: Lawrence P. Runyan
Co-PI Institution: Shoreline Community College, Seattle, WA
Co-PI Name: Steve Perry
Co-PI Institution: Shoreline Community College, Seattle, WA
FY 93 Award: $32,304
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Mathematics Classroom Computers

This project is providing students with daily access to computer hardware along with mathematical software by putting computer workstations directly into two mathematics classrooms. Each classroom has twelve computers, enabling a class of thirty-six students to work on projects in groups of three. Courses taught in these computer classrooms are being centered around problem solving teams that use the computers to do mathematics and to write reports that combine text with graphical and numerical output. Students are becoming comfortable enough with the hardware and software so that they naturally and effortlessly use the computers as they think, discuss, and experiment. Daily access, rather than occasional trips to a lab, is allowing this to happen. The project is beginning in precalculus classes and then branching to intermediate algebra and calculus. With computers close at hand, faculty are fundamentally revising the way they teach mathematics.

ID#: 9352655
PI Name: Alfred J. Patrick
PI Institution: SUNY Adirondack Community College, Glens Falls, NY
Co-PI Name: Carol E. Smith
Co-PI Institution: SUNY Adirondack Community College, Glens Falls, NY
Co-PI Name: Diane L. Doyle
Co-PI Institution: SUNY Adirondack Community College, Glens Falls, NY
Co-PI Name: Gary M. Lawler
Co-PI Institution: SUNY Adirondack Community College, Glens Falls, NY
Co-PI Name: James Harrington
Co-PI Institution: SUNY Adirondack Community College, Glens Falls, NY
FY 93 Award: $15,387
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Integrating Graphical and Analytical (GNA) Approaches in Community College Mathematics Offerings Using Palmtop Computers & Graphing Calculators

This project is integrating graphical, numerical, and analytical (GNA) approaches in all levels of the mathematics program at Adirondack Community College through the use of classroom sets of handheld palm-top computers with DERIVE and graphing calculators. Pilot programs at Adirondack have shown that it is possible to transform the traditional mathematics classroom into an active laboratory environment with cooperative groups of students exploring concepts and real world problems. The project is producing curricular and instructional changes resulting from the GNA approaches in a wide variety of courses ranging from arithmetic through differential equations. Corresponding reforms in student outcomes include an improvement in problem solving and critical thinking skills, concept attainment, motivation, and making connections. This project is serving as a model of a hands-on, active mathematics learning experience for both high schools and universities.

ID#: 9352656
PI Name: Richard Quint
PI Institution: Ventura City Community College District, Ventura, CA
Co-PI Name: Carol Howe
Co-PI Institution: Ventura College, Ventura, CA
FY 93 Award: $45,626
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Integrating Technology into Precalculus and Calculus Instruction

This project is enabling the Ventura College Mathematics Department to establish a computer laboratory classroom whose main purpose is to improve students' understanding of the major underlying concepts in precalculus and calculus. The mathematics faculty recognizes the need to utilize a computer algebra system in these courses so that students spend less time manipulating symbols and more time clarifying and visualizing mathematical principles. The center is serving as a classroom for weekly precalculus-calculus sessions. It is also serving as the location of weekly supplementary courses for precalculus-calculus enrichment. Finally, it is available to students outside of class for completing homework assignments and

for attempting to find answers to their own independent questions. Students are improving their communication skills as they work together in the laboratory/classroom setting and as they integrate prose and mathematical output into their assignments.

ID#: 9352767
PI Name: Wayne D. Gibson
PI Institution: Rancho Santiago Community College, Santa Ana, CA
Co-PI Name: Caren F. McClure
Co-PI Institution: Rancho Santiago Community College, Santa Ana, CA
Co-PI Name: Carol P. Gerachis
Co-PI Institution: Rancho Santiago Community College, Santa Ana, CA
Co-PI Name: John L. Smith
Co-PI Institution: Rancho Santiago Community College, Santa Ana, CA
Co-PI Name: Mary A. Anthony
Co-PI Institution: Rancho Santiago Community College, Santa Ana, CA
FY 93 Award: $30,000
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-15
Award Expiration Date: 1995-12-31

Improving Calculus Instruction Using Theorist And Multimedia

A computer laboratory with the mathematics software, Theorist, is being developed to relieve students from difficult algebraic calculations, thus enabling them to concentrate on concept development and understanding. In addition, multimedia presentations that explain and reinforce Calculus concepts in an exciting manner are being developed to encourage student interest and success. Five multimedia modules, on limit, continuity, differentiation, integration and series that explore, clarify and amplify concept understanding are being developed. The modules are being developed to particularly meet the needs of the divers student body; at least 50% of the institution's students are non-native English speaking and sixty-nine percent of incoming freshman place below standard college entrance level in mathematics placement tests.

ID#: 9352841
PI Name: Wesley Ostertag
PI Institution: SUNY Dutchess Community College, Poughkeepsie, NY
Co-PI Name: Anthony Zito
Co-PI Institution: SUNY Dutchess Community College, Poughkeepsie, NY
FY 93 Award: $95,010
Program: Calculus (Course and Curriculum Development)
Award Effective Date: 1993-06-01
Award Expiration Date: 1996-05-31

A Three Semester Integrated Calculus/Physics Sequence

The investigators are writing laboratory materials for and team teaching an integrated three semester sequence of courses in calculus and physics. The sequence is covering the material normally developed during the first three semesters of the standard analytical calculus sequence and the standard engineering physics sequence taken by freshmen and sophomores. The core of the project is the creation of a series of mini-labs which develop analytical topics in tandem with physical principles using data-gathering equipment connected to personal computers. The investigators are considering the long-standing pair of

problems in introductory science education: applications meant to motivate the calculus are often developed poorly and/or out of context by the calculus instructor, and mathematical tools needed in the physics course are often used by the physics instructor before they have been adequately developed in the calculus course.

ID#: 9352874
PI Name: Frank Beatrous
PI Institution: University of Pittsburgh, Pittsburgh, PA
Co-PI Name: Llinas
Co-PI Institution: University of Pittsburgh Greensburg Campus
FY AWARD: $144,443
Program: Calculus (Course and Curriculum Development)
Award Effective Date: 1993-09-01
Award Expiration Date: 1997-02-28

The Western Pennsylvania Calculus Technology Consortium

A technology enhanced calculus courses is being established at two campuses of the University of Pittsburgh. The approach adopted in the courses is based on the Calculus & Mathematica (C&M) project developed at the University of Illinois by H. Porta and J.Uhl and at Ohio State University by W. Davis. Pilot courses using C&M have been taught at the University of Pittsburgh since the Spring of 1991. The CALC-TECH project is facilitating large scale implementation of the C&M project on the two campuses. This requires workshops for faculty and graduate teaching assistants, development of materials, and evaluation.

ID#: 9352900
Award Effective Date: 1993-07-15
Award Expiration Date 1996-02- 29
PI Name: Robert S. Cole
PI Institution: Evergreen State College, Olympia, WA
Co-PI Name: Janet Ray
Co-PI Institution: Seattle Central Community College
FY 93 Award: $252,506
PROGRAM : Course and Curriculum Development

The Washington Center Calculus Dissemination Project

The Washington Center for Improving the Quality of Undergraduate Education, is augmenting and extending for another two years the work of its Washington Center Calculus Project. The goals for the project are to build sustainable institutional commitment to calculus reform efforts already initiated, to deepen understanding of assessment tools appropriate to some of the new pedagogies being used in teaching calculus, to increase the number of institutions using reform calculus curricula, and to document the dissemination model they are using for statewide calculus reform. This project broadens the scope of the work in which they are currently engaged, and focuses more upon sustaining and institutionalizing curricular reform, rather than initiating it, and upon developing and documenting assessment and dissemination methods appropriate to regional initiatives. Activities include assessment workshops, an Assessment Task Force with a seed grant program for assessment projects, curriculum workshops for faculty members, site visits, newsletters, and follow-up workshops.

PI Name: Alfredo G. de los Santos
PI Institution: Maricopa County Community College District
FY 93 Award: $100,000
Program: Calculus (Course and Curriculum Development)
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Maricopa Mathematics Consortium (M2C) Project

The Maricopa Mathematics Consortium (M2C)--composed of the Maricopa County Community College District, the second largest community college district in the country; Arizona State University, the fifth largest public university in the United States; and four public school districts in Maricopa County-- are instituting a two-year project that is resulting in significant systemic change in the teaching/learning process in precalculus mathematics: the bridge to calculus. The participating institutions, who serve 235,000 students, have a long history of cooperation and joint development. This collaborative effort includes restructuring the curriculum, developing materials to reflect the changes to be made, and using technology and new pedagogies. Faculty/staff development is being provided during all phases to build faculty support and confidence in these new approaches to teaching mathematics. During the evaluation process, they are examining outcomes at key benchmark points in the areas of faculty development, student learning, and developmental processes. A team of administrators, faculty, and staff are providing leadership and management to the project with support from key individuals who serve on the National Advisory Committee.

ID#: 9352894
PI Name: Gregory D. Foley
PI Institution: Sam Houston State University, Huntsville, TX
Co-PI Name: David K Ruch
Co-PI Institution: Sam Houston State University, Huntsville, TX
COLLABORATING Two-Year COLLEGES
Lee College -- Wayne Miller and Earl Hines
San Jacinto College, Central -- Sharon Sledge and June Bjercke
Tomball College -- Roger Jay
FY 93 Award: $70,000
Program: Calculus (Course and Curriculum Development)
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

Calculus For Comprehensive Universities and Two-Year Colleges

The goals of this project are to design and implement a curriculum for the critical first year of calculus at comprehensive universities and two-year colleges. The program adapts and synthesizes methods from successful calculus reform efforts and is crafted to meet local needs.
The curriculum stresses and facilitates cooperative learning, develops visual thinking with the aid of interactive graphing technology, and uses writing to help students learn and communicate mathematics. These methods are integrated in an environment that focuses on the central ideas of calculus and provides a progression of problems and projects to challenge students while improving their confidence and study skills. The project establishes a collaborative partnership among Sam Houston State University, Lee College, San Jacinto College Central, and Tomball College. Two faculty members from each of these four institutions serve as site leaders. All eight site leaders will meet regularly to share ideas, experiences, and materials. A volume of student assignments is being compiled to serve as a resource for college faculty across the nation.

INTERDISCIPLINARY

ID#: 9156213
PI Name: Rhoda K. Berenson
PI Institution: SUNY Nassau County Community College, Garden City NY
Co-PI Name: Kimberley T. Pearlstein
Co-PI Institution: SUNY Nassau County Community College, Garden City NY
Co-PI Name: Shirley Aronson-Unger
Co-PI Institution: SUNY Nassau County Community College, Garden City NY
Co-PI Name: Thomas G. O'Brien
Co-PI Institution: SUNY Nassau County Community College, Garden City NY
FY 93 Award: $55,192
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1992-01-15
Award Expiration Date: 1994-06-30

Improving Scientific Literacy of Undergraduate Students through Multidisciplinary Science Courses

This project addresses the problem of scientific illiteracy by designing multidisciplinary science courses which cohesively integrate the study of the physical and life sciences and emphasize scientific inquiry--observing, questioning, and making connections and inferences. The overall goal is to produce citizens who are capable of reading about and understanding contemporary scientific issues. Building on prior experience with FIPSE, NEH and projects to devise learning strategies and design multidisciplinary courses, the project is (1) developing two multidisciplinary laboratory science courses for non-science students; (2) preparing materials so that these will be student-centered "active learning" courses; and (3) preparing faculty to teach these courses. As a result, after three years, the courses are to be mainstreamed into the Nassau Community College curriculum, 12 faculty are to be prepared to teach each course, and the courses and the materials prepared for them are to serve.

ID#: 9253963
PI Name: Clare C. Bailey
PI Institution: Fl Community College Jacksonville, Jacksonville, FL
Co-PI Name: Aubra J. Riddle
Co-PI Institution: Fl Community College Jacksonville, Jacksonville, FL
Co-PI Name: Chew Lean Lee
Co-PI Institution: Fl Community College Jacksonville, Jacksonville, FL
Co-PI Name: Jane D. Gant
Co-PI Institution: Fl Community College Jacksonville, Jacksonville, FL
Co-PI Name: John Q. Mullins
Co-PI Institution: Fl Community College Jacksonville, Jacksonville, FL
FY 93 Award: $78,000
Program: Course and Curriculum Development
Award Effective Date: 1993-03-15
Award Expiration Date: 1994-11-30

Improving Science and Mathematics Education Through Integrated Content and Interactive Discovery Learning

This project is developing an integrated introductory course in undergraduate science and mathematics by a team of faculty and professional staff in science, mathematics, and psychology representing three of our four major campuses of Florida Community College at Jacksonville. The work is integral to the College's long range plan to revitalize the curriculum and make learning an exciting and rewarding process. The goals are to increase understanding and retention of complex subject matter, while at the same time make these enjoyable experiences, leading to the adoption of life-long learning habits by students. Teaching faculty have teamed with psychologists versed in applications of learning and motivation theory to the classroom as well as in the application of technology to the learning process. The faculty team is developing an introductory level undergraduate course combining the central themes of cycles, information, and change common across scientific disciplines including botany, microbiology, chemistry, physics, and mathematics. The developers are team teaching the course using strategies that integrate science and mathematics and focus on the interrelationships among the sciences and mathematics. The course is being delivered in electronic classrooms that allow team teaching via telecommunications systems providing graphic, audio and visual interaction between faculty and students located on both the North and Downtown Campuses. The course is engaging student in learning by discovery exploration and collaborative partnerships between students and faculty and administrators acting as mentors to student teams.

ID#: 9254184 **T
PI Name: Judith Tavel
PI Institution: SUNY Dutchess Community College, Poughkeepsie NY
FY 93 Award: $115,000
Program: Course and Curriculum Development
Award Effective Date: 1993-06-01
Award Expiration Date: 1995-11-30

Basics for Technicians: An Integrated Course of Study Encompassing Mathematics and Physics

Building on experience in programs to upgrade the educational background of personnel working in industry, Dutchess Community College is developing an integrated curriculum which could become a certificate program in basics for industrial technicians. A faculty team is developing a single, unified course integrating elements from what are currently separate courses in introductory mathematics, chemistry, physics, English and reading. Modern manufacturing is being used as the integrating theme. The project is significantly changing the undergraduate learning experience through the employment of new curricula, innovative laboratories, new delivery systems, and fresh instructional materials. It is hoped that the project will be a blueprint for the development of an industrial technology certificate granting program which can be replicated by other institutions of higher education, particularly technical colleges.

ID#: 9346871
PI Name: Daniel Friedman
PI Institution: Howard Community College, Columbia, MD
Co-PI Name: Russell A. Poch
Co-PI Institution: Howard Community College, Columbia, MD
FY 93 Award: $149,976
Program: Course and Curriculum Development
Award Effective Date: 1992-08-15
Award Expiration Date: 1995-01-31

Fostering Computational Problem-Solving Skills in Introductory Sciences: An Interactive Multimedia Curriculum

To assist students to acquire the basic quantitative problem-solving skills they need to succeed in science, Howard Community College, MD, working collaboratively with Cumberland County College, NJ, and other community colleges, is creating an interactive multimedia program to teach scientific computational fundamentals. The program is diagnosing and teaching students at three levels (based on Gagne's cognitive skills hierarchy) of scientific computational skills--reviewing specific science-related math skills, applying math to specific science-related tasks and performing scientific problem-solving. The program, draws upon all the graphic, sound, computer-branching, and video capabilities of multimedia instruction, includes a test instrument that is used to assess students prior knowledge, devise an individualized learning plan, and evaluate knowledge gained. The instructional components are "generic"--not specific to any one science discipline--but separate problem sets are being developed for biology, chemistry, and physics thereby customizing the program to each discipline. The innovative curriculum, including adaptation of classroom instruction, is being evaluated at the project colleges, as well as several other two-year colleges serving as independent peer review sites.

ID#: 9255520
PI Name: Khamis S. Siam
PI Institution: Pittsburg State University, Pittsburg, KS
Co-PI Name: Suzan H. Schafer
Co-PI Institution: Pittsburg State University, Pittsburg, KS
Co-PI Name: Joan Pearson
Co-PI Institution: Labette Community College
Co-PI Name: Donald J. Lind
Co-PI Institution: Coffeyville Community College
FY 93 Award: $199,999
Program: Undergraduate Faculty Enhancement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-04-30

Enhancement of Science/Mathematics Faculty Through Modeling: A Path Toward Critical Thinking

A coalition of six two-year and one four-year colleges in southeastern Kansas is designing a multidisciplinary project for faculty enhancement. In each of two summers there are several week-long workshops designed to: (1) enhance content knowledge, (2) enhance critical thinking skills through the use of modeling, and (3) develop instructional strategies to promote effective teaching. Content areas include: modeling theory, molecular modeling, modeling in environmental science, recombinant DNA, revised college algebra, chromosome mapping, Maple V, chaos and fractal geometry, and classroom assessment. Participants are developing and adopting curricular materials and assessment skills appropriate for their institutions. Academic year activities provide continuity and participant support.

ID#: 9350786
PI Name: Herbert Richey
PI Institution: Maysville Community College, Maysville, KY
Co-PI Name: Darrell H. Abney
Co-PI Institution: Maysville Community College, Maysville, KY

Co-PI Name: Lloyd E. Story
Co-PI Institution: Maysville Community College, Maysville, KY
Co-PI Name: Sharon Wilson
Co-PI Institution: Maysville Community College, Maysville, KY
FY 93 Award: $56,308
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-04-15
Award Expiration Date: 1995-09-30

Interdisciplinary Physics/Physiology Laboratory

A Physics/Physiology Laboratory is established with fourteen computerized lab stations for shared use by students in undergraduate Physics and Physiology transfer courses. This equipment is facilitating the addition of three new dimensions to the present science curriculum:

- Physics students are being provided with real-time acquisition and display of data gathered from experiments in the areas of motion, heat, sound, electricity, magnetism and light;
- Physiology students are being provided with hands-on experiences recording basic electrophysiological phenomena such as EMG, EEG, ECG, nerve conduction velocities, blood flow rates and respiration rates and volumes;
- Physics and Physiology students are being provided with interdisciplinary laboratory experiences through their work on team assignments.

In addition to the pedagogical advantages offered by hands-on experiences and real-time data acquisition and display, grouping of physiology and physics students together into interdisciplinary teams is increasing students' retention and depth of understanding of concepts by providing opportunities for cooperative learning as well as increasing students' understanding of the interrelatedness of science.

ID#: 9350796
PI Name: David L. Byrd
PI Institution: Enterprise State Junior College, Enterprise, AL
Co-PI Name: Charla Adkison
Co-PI Institution: Enterprise State Junior College, Enterprise, AL
Co-PI Name: Kathy S. Haynes
Co-PI Institution: Enterprise State Junior College, Enterprise, AL
Co-PI Name: R.C. Lewis
Co-PI Institution: Enterprise State Junior College, Enterprise, AL
FY 93 Award: $45,970
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

An Interdisciplinary Interactive Computer Laboratory For the Improvement Of Undergraduate Science and Mathematics Instruction

In order to improve undergraduate instruction and enhance student achievement in freshman and sophomore science and mathematics courses at Enterprise State Junior College, an interactive computer facility is being established. More specifically, the goal of the project is to improve mathematics and science instruction, particularly for women, by allowing instructors to develop and apply field tested courseware which is enhancing conventional instruction, providing for effective simulations and tutorials, and enabling students to acquire skills in using modern laboratory apparatus and instrumentation in the context of designing and conducting meaningful scientific and mathematical inquiries. The project is also adding to the body of knowledge related to effective instruction of undergraduates and serving as a model demonstration center for other two -year colleges.

ID#: 9350951
PI Name: Cynthia T. Hahn
PI Institution: Bristol Community College, Fall River, MA
Co-PI Name: Ann Whitney-Roper
Co-PI Institution: Bristol Community College, Fall River, MA
Co-PI Name: Bernice Bowdoin
Co-PI Institution: Bristol Community College, Fall River, MA
Co-PI Name: Cecilia Medeiros
Co-PI Institution: Bristol Community College, Fall River, MA
Co-PI Name: James Constantine
Co-PI Institution: Bristol Community College, Fall River, MA
FY 93 Award: $39,859
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

Improved Core Science Courses for Engineering Transfer Students

This project is providing improved learning opportunities in mathematics, chemistry and physics for engineering majors through the creation of a microcomputer laboratory designed to support instruction in these courses. To demystify the abstract nature of these courses, engineering majors need an environment in which they can interact with one another in working complex experiments and in solving problems with an increased interdisciplinary base. An instructor-developed program to track both student time and their level of success on computer assignments is becoming an integral part of these courses. Feedback from the program advises students of their progress toward skill development in time to secure assistance. Feedback to the instructor regarding the nature and extent of student progress toward required skills is allowing the learning process to inform the teaching process on a cyclical basis. To implement the proposed change in the instructional process within math and science courses, a series of computer modules are being created to support the new methodology. These modules are based on existing course topics but designed to provide students with the opportunity to:

- Practice with problem solving;
- Discover underlying concepts and principles;
- Interrelate learning between disciplines;
- Investigate complex and tedious problems; and,
- Compete effectively in an increasingly technologically literate and student population.

ID#: 9351180
PI Name: Daniel Friedman
PI Institution: Howard Community College, Columbia, MD
Co-PI Name: Russell A. Poch
Co-PI Institution: Howard Community College, Columbia, MD
Co-PI Name: Susan Bard
Co-PI Institution: Howard Community College, Columbia, MD
FY 93 Award: $39,997
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Real-Life Problem Solving Laboratories for Undergraduate Sciences

The Howard Community College Science Department is upgrading its computer-based experimental laboratory to promote real-life, real-time problem-solving in its science classes. While the specifics vary in each discipline, the new laboratory equipment is allowing HCC:

- To acquire probeware that allows the collection and manipulation of real-world data for problem-solving and conceptual model building exercises;
- To incorporate more real- world multimedia instruction into computer-based simulations, experiments, and problems;
- To utilize real-time data analysis and manipulation tools to improve student facility with and comprehension of laboratory observations and information.

The equipment is supporting a flexible laboratory operation that serves approximately 2,500 annually. The laboratory is also be used for professional development for K-12 teachers as well as a showcase for other area colleges.

ID#: 9352059
PI Name: Milton E. Myers
PI Institution: Delaware City Community College, Media, PA
FY 93 Award: $45,000
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-15
Award Expiration Date: 1995-12-31

A Math/Science Learning Lab: A Multi-Disciplinary Approach To Improving The Teaching/Learning Process

Delaware City Community College is establishing a Math/Science Learning Lab to improve and expand the teaching/learning processes of mathematics and science by incorporating integrated computer technology into every course of instruction. The lab is being used to present new material to entire classes; stimulate advanced and independent study activities; provide an environment to produce laboratory simulations; enable faculty to use more varied formative and summative assessment techniques to monitor student progress; implement specialized software programs for instruction; and shift the emphasis of teaching to a more conceptual approach. An important additional outcome of this technologically-advanced learning environment is to serve as a model to other undergraduate institutions, particularly community colleges, in creating new ways to stimulate and enhance learning in math and science.

ID#: 9352126
PI Name: Stephens C. Hoops
PI Institution: Penn St. University New Kensington, New Kensington, PA
Co-PI Name: Clarence W. Finley
Co-PI Institution: Penn State University New Kensington New Kensington PA
Co-PI Name: Theodore T. Ziegenfus
Co-PI Institution: Penn State University New Kensington New Kensington PA
Co-PI Name: William E. Hamilton
Co-PI Institution: Penn State University New Kensington New Kensington PA
FY 93 Award: $43,612
Program: Instrumentation and Laboratory Improvement

Award Effective Date: 1993-05-15
Award Expiration Date: 1995-09-31

Integrating Molecular Visualization into Experiments in Introductory Biology

This project is implementing change in the design of experiments for first and second year biology and chemistry courses by introducing the capability to conceptualize and visualize structures and transformations in three dimensions. The design engages students in experiments which connect lectures and laboratory and which reflect the intellectual and laboratory practices of life scientists and chemists. Students study biological or chemical material in two ways. The student analyzes the molecular structure using computer-based tools and also manipulates the same material in laboratory. The instruments which provide the capability for viewing and analysis of molecular structure are molecular visualization software running on high-resolution graphics personal computers and molecular models.

ID#: 9352159
PI Name: Don A. Berkowitz
PI Institution: Chesapeake College, Wye Mills, MD
FY 93 Award: $30,555
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

Integration of Computer and Multimedia Technology into Traditional Science Laboratory Curricula

This project is developing a model science laboratory at Chesapeake College's Cambridge Satellite Center in Dorchester County. Through the use of innovative, hands-on approaches as well as the direct use of multi-media, data manipulation and simulational software, this laboratory is being used to involve students in science and technology, help them to establish a science knowledge base from which to work, and encourage them to follow a career path in a science or engineering field. Faculty are revising the approach currently employ in teaching the basic biological and physical sciences to provide an enhanced learning environment that calls upon students' natural curiosity as a starting point in the design of experiments. It is anticipated that this grant will markedly improve the recruitment of science candidates from a targeted minority population that resides in the area.

ID#: 9352177
PI Name: Ronald M. Marcy
PI Institution: Mississippi Gulf Coast Community College, Perkinston, MS
Co-PI Name: David L. Waldorf
Co-PI Institution: Mississippi Gulf Coast Community College, Perkinston, MS
Co-PI Name: William G. Chatham
Co-PI Institution: Mississippi Gulf Coast Community College, Perkinston, MS
FY 93 Award: $41,703
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-06-15
Award Expiration Date: 1995-11-30

Open Science Computer Laboratory

This project is establishing an Open Science Computer Laboratory to serve the core chemistry and physics courses at Mississippi Gulf Coast Community College. The Laboratory, equipped with networked IBM PS/2 computers, offers a four-level instructional program: computer simulation experiments; data analysis; data acquisition; and construction of a computer interface device. Through the Laboratory, the College is offering a 4-week summer course for area high school students exposing them to the material in level one and two of the physical science curriculum.

ID#: 9355473
PI Name: Patricia A. Cunniff
PI Institution: Prince George's Community College, Largo, MD
FY 93 Award: $80,246
Program: Undergraduate Faculty Enhancement
Award Effective Date: 1993-08-15
Award Expiration Date: 1995-01-31

Coalition Building for Effective Faculty Enhancement a Two-Day Workshop

Prince George's Community College is developing and coordinating a two-day invitational conference for the principal investigators from the two-year and four-year coalitions that have been supported under the Undergraduate Faculty Enhancement (UFE) program. In addition, several principal investigators who have been supported under Calculus and the Course and Curriculum Development (CCD) that are coalition type activities and other selected individuals with expertise in coalition building are also attending. A guidebook for individuals who are developing, planning, and leading coalitions is being written. The guidebook contains such information as descriptions of successful coalitions, barriers to coalition building and models for overcoming these barriers, other potential coalition models, recruitment strategies, evaluation mechanisms, and methods for sustaining coalitions. Each coalition represented is also developing as a result of this conference a manuscript for submission to a newsletter or professional journal about their coalition activities.

PHYSICS

ID#: 9254094
PI Name: William R. Warren
PI Institution: Lord Fairfax Community College, Middletown, VA
FY 93 Award: $30,649
Program: Course and Curriculum Development
Award Effective Date: 1993-01-15
Award Expiration Date: 1995-06-30

A Combined Calculus-Based/Non-Calculus Introductory Physics Course Using The Workshop Physics System

The Workshop Physics system, in which traditional lectures and laboratories are replaced by interactive learning methods and micro-computer-based laboratory activities, are be used to provide a combined calculus-based/non-calculus introductory physics course. Additional interactive methods such as conceptual exercises, collaborative problem-solving, and multimedia technology are being incorporated into the existing Workshop Physics curriculum. This is resulting in improved student learning and more efficient use of instructor time.

ID#: 9255466
PI Name: Curtis J. Hieggelke
PI Institution: Joliet Junior College, Joliet, IL
Co-PI Name: Thomas L. O'Kuma
Co-PI Institution: Lee College, Baytown, TX
FY 93 Award: $120,000
Program: Undergraduate Faculty Enhancement
Award Effective Date: 1993-02-15
Award Expiration Date: 1994-07-31

Community College Physics Workshop Project

In this project at least 100 short case studies or mathematical "snapshots" are being created. Each is designed to encourage appreciation of mathematics among under-achieving and under- motivated students. Following the compilation of these modules involving substantial library research and industry support, they are being class tested at several institutions. The project's short case studies differ from existing case studies (UMAP, COMAP, etc.). They require few prerequisites, are shorter, rely mainly upon oral presentation by instructors, and are adaptable to a broad range of textbooks. They are supplements to existing course work designed to motivate student interest in the subject matter and to show its relevance. Among the studies' goals is highlighting contributions of underrepresented groups, thereby providing role models for students. The project is based upon preliminary work which yielded promising results. The studies are being drawn from a broad range of fields, all highlighting a "snapshot" of applied mathematics. After classroom testing, the project concept and results are being disseminated by a regional seminar. During this seminar, not only will participating instructors learn about the project and receive a booklet containing the developed modules, but these faculty are also being provided the skills and knowledge necessary to design and implement studies for their classrooms.

ID#: 9350836
PI Name: Robert Sauer
PI Institution: Chipola Junior College, Marianna, FL
FY 93 Award: $15,072
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-15
Award Expiration Date: 1995-12-31

The Technological Enhancement of a Student Oriented Physics Laboratory

This project upgrades and augments the use of a ten station physics laboratory by allowing students the use of computers and other state-of-the-art equipment. In these laboratories students examine the physical laws and concepts of physics not only by experimentation during laboratory sessions, but also on an individual basis from assignments made in the classroom or honors class. By the use of the computer and computer interfacing with sensors, students are able to more quickly and more carefully analyze data while

controlling the variables in their experiments. By using CD ROM and interactive computer soft ware, students are better able to study the concepts in their honors projects o r the concepts presented as classroom activities. The project is structured to help increase the students' analytical abilities, to augment their understanding of the physical laws of nature, and to develop their skill in using modern scientific apparatus. With the integration of the new equipment in the laboratory, students gain experiences that go well beyond those that they would receive in traditional general and introductory physics laboratory programs.

ID#: 9351435
PI Name: Mark W. Moore
PI Institution: John Wood Community College, Quincy, IL
FY 93 Award: $28,942
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-07-15
Award Expiration Date: 1995-12-31

Interactive Computer Interfaced Physics and Chemistry Laboratory

Interactive, computer interfaced physics and chemistry laboratories are being utilized for a guided inquiry and discovery approach in the teaching of general introductory classes in physics and chemistry. The laboratory centered approach to teaching chemistry and physics is intended to attract students who have avoided traditional science instruction and to retain students who would otherwise be turned off by such instruction by making learning individualized, interactive, participatory, exploratory and visual. This approach has been tested and proven to improve the learning, retention, and application of physics and chemistry principles by promoting conceptual understanding and relating the laboratory experience to the real world. At each workstation the student determines strategies for solving a problem, chooses the initial conditions and predicts the result of the experiment, and the microcomputer performs data collection, analysis, and graphing functions and/or performs simulations of real experiments through interactive software and videodisc technology . Because this approach is more efficient, students are motivated to learn more by trial and error probing.

ID#: 9351543
PI Name: W. Steve Quon
PI Institution: Ventura City Community College District, Fountain Valley, CA
FY 93 Award: $23,159
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-15
Award Expiration Date: 1996-01-31

Modern Optics Equipment for Science and Engineering Majors

A modern optics laboratory course is being developed with state-of-the-art optical technologies including lasers, photodetectors with computer interfacing, fiber optics, optomechanical fixtures, and ray tracing optic computer software. The course has weekly laboratory classes which make use of small group mentoring activities.

ID#: 9351589
PI Name: Patrick Keefe
PI Institution: Clatsop Community College, Astoria, OR
Co-PI Name: Anne Klinger
Co-PI Institution: Clatsop Community College, Astoria, OR
Co-PI Name: John Westling
Co-PI Institution: Clatsop Community College, Astoria, OR
Co-PI Name: Larry Determan
Co-PI Institution: Clatsop Community College, Astoria, OR
FY 93 Award: $18,538
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-08-01
Award Expiration Date: 1996-01-31

Integrating Analytical Thinking into Workshop Physics

The main goal of this project is to improve the learning, retention and application of physics principles and concepts by students studying physics at Clatsop Community College (CCC). This is being accomplished by incorporating a series of new investigations using contemporary computer technology into the curriculum. Microcomputers are used to perform data collection and graphing in the areas of force, motion, temperature, and radiation. The microcomputers are being used to provide immediate feedback for student analysis of data, which stimulates them to experiment on their own with a larger number and variety of trials, to discover relations in the physical world. Six networked Microcomputer Based Labs (MBLs) have been obtained, all of which are equipped with a Universal Lab Interface (ULI), appropriate sensors and software. A master MBL station equipped with a high resolution Monitor, SuperDrive, modem and power source has also been obtained. This equipment is revitalizing the physics and Integrated Technologies programs at CCC, and is providing the necessary technology to further the college's stated mission to prepare physics students to meet the challenges of science in the next century. This project is encouraging students to continue to study and support science by improving their experiences with physics.

ID#: 9255544
PI Name: Robert B. Clark
PI Institution: Texas A&M, College Station, TX
Co-PI: Thomas L O'Kuma
PI Institution: Lee College, Baytown, TX
FY 93 Award : $123,091
Program: Undergraduate Faculty Enhancement
AWARD EFFECTIVE Date: 1993-05-01
Award Expiration Date:: April 30, 1994

Southwest Regional Two-Year College Physics Faculty Enhancement Program

This two-year program is designed to serve as a model for the utilization of cooperative relationships between university professors and outstanding two-year college physics faculty members working together to provide professional inservice enrichment training for two-year college physics faculty in the Southwestern United States. The program focuses on recent developments in physics research, innovative physics teaching methods, successful techniques for recruiting local minority students into two-year college science and engineering programs. The program includes an annual May Institute at Texas A&M University, academic year follow-up workshops, local projects by participants, and staff visits to participants' campuses.

ID#: 9345085
PI Name: Robert B. Clark
PI Institution: Texas A&M, College Station, TX
Co-PI: Thomas L O'Kuma
Co-PI Institution: Lee College, Baytown, TX
Supplement to the above FY 93 Award : $30,000
Program: Undergraduate Faculty Enhancement

See title and abstract above.

ID#: 9351503
PI Name: George F. Tucker
PI Institution: Russell Sage College, Sage Junior College of Albany
FY 93 Award: $13,243
Program: Instrumentation and Laboratory Improvement
AWARD AFFECTIVE DATE : 1993-07-15
Award Expiration Date: 1995-12-31

Sage Junior College of Albany Physics Laboratory Enhancement

The project's main goals are to enhance Sage Junior College of Albany students' understanding of the basic concepts of physics and to encourage more students to consider careers in science. This is being accomplished by introducing microcomputer-based experiments into physics laboratories and the physics elective courses, Astronomy and Energy and the Environment. Students are employing the computers to collect, analyze and graph experimental data. The immediate feedback students receive encourages participation and innovation. Support was obtained for software and hardware for six, networked Macintosh computers each equipped with a Universal Lab Interface and a variety of probes and sensors and a networked printer. A modem is used to obtain software from remote locations. A CD-ROM drive improves the curriculum of the elective courses. Software, including a spreadsheet, physics and astronomy simulations, and utilities, has also been purchased. This project is stimulating the teaching of physics related courses at the College. It exposes students to modern apparatus and data collection techniques. It prepares and encourages students, especially women, minorities, and mature students, to consider careers in science.

ID#: 9351677
PI Name: R. Daryl Pedigo
PI Institution: Austin Community College, Austin, TX
FY 93 Award: $44,082
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

Video On The Computer: A Microcomputer-based Physics Laboratory

This project demonstrates the use of video lab exercises as part of a complete program of microcomputer-based laboratory physics instruction. Recent technological developments which allow live video to be captured directly on standard computer memory are being exploited to eliminate the need for laser video discs. This is proving to be a very cost-effective method for creating and storing new physics video

experiments. A Local Area Network composed of twelve Macintosh IIvx student workstations and two Macintosh Quadra video capture stations are being assembled. Each workstation is being interfaced with appropriate sensors and probes, allowing data acquisition and analysis as well as video playback and editing. Students perform selected video experiments in addition to more standard laboratory work. Physics and pre-Engineering students design, shoot, and analyze their own video laboratory experiments. Students in all courses produce electronic lab reports -- audio/video clips stored in computer memory together with text and graphics detailing their analyses. Along with their video work, students employ spreadsheets in analyzing data from experiments modeled on those developed under previous NSF- and FIPSE-sponsored work -- notably Workshop Physics and Tools for Scientific Thinking. The focus is on active involvement of students and conceptual development based on hands-on experience.

ID#: 9352057
PI Name: Robert Dell
PI Institution: SUNY Mohawk Valley Community College, Utica, NY
Co-PI Name: Clinton R. Carpenter
Co-PI Institution: SUNY Mohawk Valley Community College, Utica, NY
FY 93 Award: $31,983
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-05-01
Award Expiration Date: 1995-10-31

Computerization of Physics Laboratory (CPL)

This project results from a two and one-half year MVCC Physical Science Department "pilot program". This program involves the laboratory development and testing of microcomputer-based applications to improve the physics laboratory experience and further enhance the students' critical thinking skills. The project objectives are to:

- modernize performance of certain traditional experiments,
- provide a platform for introducing certain cognitive based learning experiences,
- stimulate learning and creative thinking by the use of numerical based open-ended simulation exercises, and
- expose students to emerging physics based technologies important to their curricula.

The objectives are being accomplished by the creation of a "state of the art" fully networked Macintosh based physics lab. Eight (8) workstations are set up in the physics laboratory and are being used to accomplish the objectives. New laboratories and instructional techniques are being developed to integrate the latest in Engineering Physics, General Physics, Descriptive Astronomy, and Photographic Science technologies. The long range goal is to develop a multidisciplinary course structure to meet the emerging demands of four-year transfer institutions.

ID#: 9352284 **T
PI Name: Thomas L. O'Kuma
PI Institution: Lee College, Baytown, TX
Co-PI: Name: Curtis J. Hieggelke
Co-PI Institution: Joliet Junior College, Joliet, IL
FY 93 Award: $98,833
Program: Instrumentation and Laboratory Improvement (Leadership in Laboratory Development)
Award Effective Date: 1993-06-16
Award Expiration Date: 1995-11-30

Microcomputer-Based Laboratories (MBL) for Two-Year College Introductory Physics Courses

The intent of this project is to (1) adapt and refine for the two-year college environment existing microcomputer-based laboratory (MBL) curriculum materials and (2) to extend this area by developing additional MBL curriculum pieces that provide a more complete collection of laboratory activities for introductory physics laboratories. The targeted laboratories include the laboratory from the calculus-based course, trigonometry-based course, conceptual-based (liberal arts) course, and the technical physics (for technical/vocational students) course. These curriculum pieces are being initially tested at two different two-year college laboratories and then tested further at several other two-year college sites.

PSYCHOLOGY BIOLOGICAL ASPECTS

ID#: 9350962
PI Name: Jerry Rudmann
PI Institution: Saddleback College, Mission Viejo, CA
Co-PI Name: Elizabeth L. Mulholland
Co-PI Institution: Saddleback College, Mission Viejo, CA
FY 93 Award: $40,131
Program: Instrumentation and Laboratory Improvement
Award Effective Date: 1993-09-01
Award Expiration Date: 1996-02-28

Development of a Social Science Computer Laboratory to Improve Undergraduate Science Instruction

This project is establishing a social and behavioral sciences computer laboratory that introduces undergraduate students to computer-based social science research. To fully understand and appreciate the scientific dimensions of the social sciences, students are actively involved in conducting research, and are encouraged to become scientifically literate, self-directed, computer literate learners. Students also study social science issues with real data, using state-of-the-art hardware and software. With this foundation, majors are being much better prepared for upper division work, while non-majors have an enhanced understanding and appreciation for the scientific basis of social science knowledge.

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You will receive a list of all the documents on STIS and instructions for retrieving them. Please note that all requests for electronic documents should be sent to **stisserv**, as shown above. Requests for printed publications should be sent to **pubs@nsf.gov.**

Getting Started with Anonymous FTP

FTP to *stis.nsf.gov*. Enter *anonymous* for the username, and your E-mail address for the password. Retrieve the file "index". This contains a list of the files available on STIS and additional instructions.

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If you are on the Internet: *telnet stis.nsf.gov*. At the login prompt, enter *public*.

If you are dialing in with a modem: Choose 1200, 2400, or 9600 baud, 7-E-1. Dial (703) 306-0212 or (703) 306-0213

When connected, press *Enter*. At the login prompt, enter *public*.

Getting Started with Direct E-Mail

Send an E-mail message to the Internet address **stisserv@nsf.gov**. Put the following in the text:

get stisdirm

You will receive instructions for this service.

Getting Started with Gopher and WAIS

The NSF Gopher server is on port 70 of **stis.nsf.gov.** The WAIS server is also on **stis.nsf.gov.** You can get the ".src" file from the "Directory of Servers" at **quake.think.com.** For further information contact your local computer support organization.

For Additional Assistance Contact:

E-mail: *stis@nsf.gov* (Internet)

Phone: (703) 306-0214 (voice mail)

TDD: (703) 306-0090

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